AMERICAN MACHINIST

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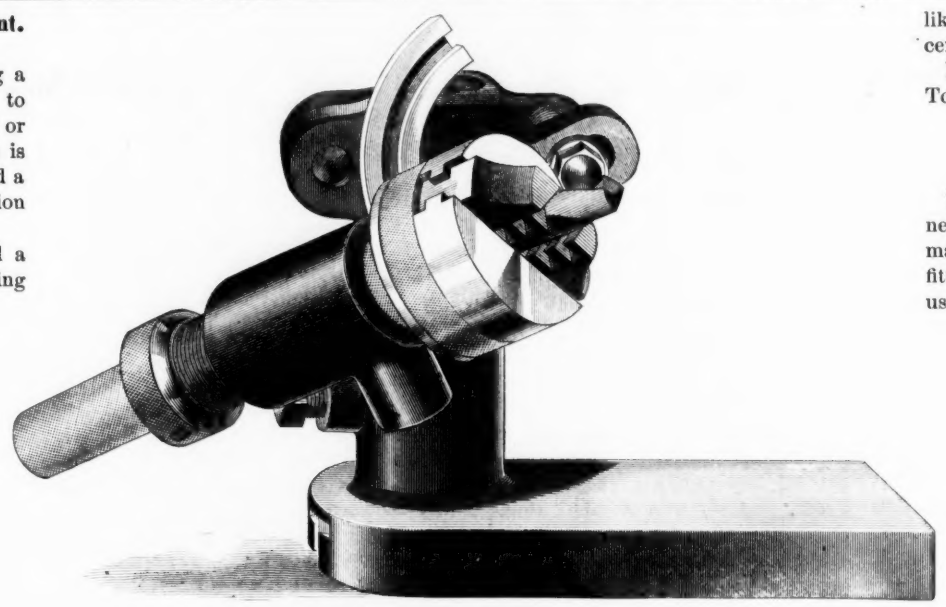
Hand's Twist Drill Grinding Attachment.

This tool consists of a base piece having a T slot in it, so as to be readily attached to the stand or trough of an emery grinder or grindstone. At the end of this base plate is a projection carrying an upright stem and a set screw to secure this stem in any position to which it may be adjusted.

At the upper end of the stem is secured a cross bar having two outwardly projecting lugs upon it. In one of these lugs is a screw, the blank part of which, under the head, is fitted to a slot in the arm of a carrier block, the main part of which is a tubular projection set at an angle of thirty degrees. This tubular projection is threaded internally, and is fitted with a hollow feed screw. Inside of this feed-screw is fitted the chuck arbor, which is also hollow, and has two angular slots milled in it diametrically opposite to each other, and running lengthwise. Into these grooves fit a pin, which has the end milled off to the same angle as the grooves. This pin is held in the grooves by a spiral spring passing through a lug in the carrier block, and in conjunction with the spring and grooves acts as an indexing device for alternately bringing the lips of the drill to the same position.



HAND'S TWIST DRILL GRINDING ATTACHMENT.

To the other lug on the cross bar, is pivoted by means of a screw, a segment of a circle. This segment is grooved and into the groove fits the head of a screw, the body of which is screwed into the rear end of the slotted arm of the carrier block.

It will be readily seen that when the carrier block is moved up and down, the segment will govern the character of the arc described by the end of the drill which is clamped in the chuck. The segment may be set eccentrically in respect to the screw which fits the slotted arm of the carrier block, and thus cause any desired amount of clearance to be given to the cutting end of the drill, the slot in the arm permitting the carrier block to yield longitudinally to accommodate the eccentricity of the segment. It will be understood that the segment is secured in position after adjustment, by tightening its pivot screw.

In operation the drill to be ground is clamped in the chuck with the cutting edges in a horizontal position, and projecting from $\frac{3}{8}''$ to $\frac{3}{4}''$ from the jaws, according to the size of the drill. The base of the machine is adjusted so as to bring the lip of the drill close to the grinding wheel, contact with which is made by screwing in the feedscrew.

By taking hold of the knurled handle and moving it up and down, the grinding of one lip of the drill will be accomplished. If the handle is raised up until the drill clears the grinding wheel, a slight rotative pressure in either direction will cause it to turn. When it is turned half way around, the index pin will spring into one of the grooves and hold it sufficiently firm for grinding. While in this position, the second lip of the drill can be ground, which operation is a repetition of the former. These operations can be repeated as many times as is necessary to sharpen the drill, the feed-screw being screwed in a little before each operation The amount of clearance can be changed at will, by simply loosening the pivot screw of the segment and raising or depressing it. Raising this segment gives more clearance and depressing it gives less. A very slight movement serves to change the clearance materially.

Drills of any length can be ground, as the chuck arbor has a hole in it large enough to allow a $\frac{3}{8}''$ drill to pass entirely through.

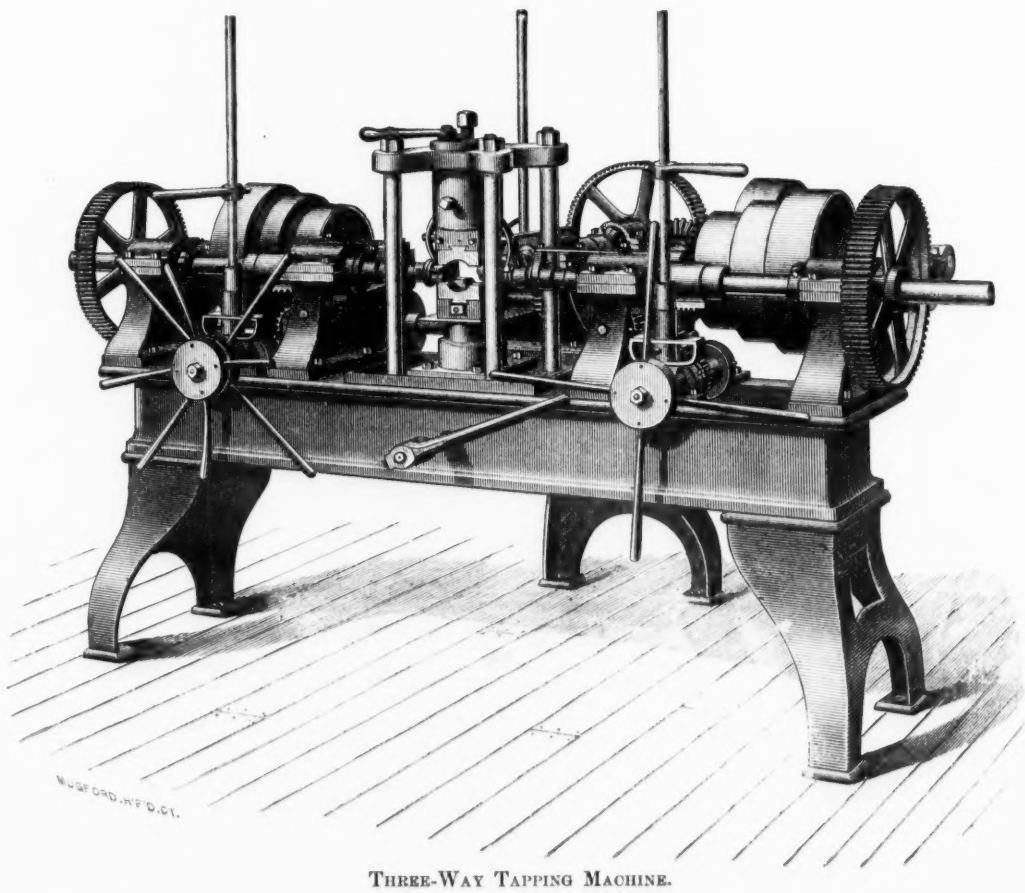
This tool can be readily attached to any grindstone, emery or cutter grinder, and is adapted for grinding drills from $\frac{3}{8}''$ down to the smallest sizes made. By its use drills can be given any amount of clearance desired for drilling metals of different densities and natures, and this in either direction; that is to say, that a right or left handed drill can be ground with equal facility.

The purpose of the manufacturer of this tool, is to furnish an inexpensive device that may be used with the ordinary grinding appliances common to all shops. It is a very handy tool for machine shop and tool-room use, and will be appreciated by those who like to see a certain sized drill make a certain sized hole.

It is manufactured by S. Ashton Hand, Toughkenamon, Chester County, Pa.

Three-Way Tapping Machine.

The annexed cut shows in perspective a newly-designed three-way tapping machine, made specially for tapping all kinds of pipe fittings, ranging from the smallest pipe in use up to pipes four inches diameter. The machine has been got up in a form which combines strength and rigidity with convenient compactness. One very important feature in this machine consists in a very expeditious manner in which the fittings are held in the jaws while being tapped. This is performed by means of a lever attached to a cam, which secures the fitting to be tapped, and also to release it instantaneously by a quick movement of the lever. When the taps have reached the required depth in the fitting they are caused to reverse promptly by a simple automatic device in connection with the shipper rods, which operate the overhead driving belts on tight and loose pulleys. The taps are each one drawn into the fitting by means of the lever wheels, as shown in the engraving. They are each one independent of the other, but all three can be started in together simultaneously.



THREE-WAY TAPPING MACHINE.

In connection with these machines automatic taps in all sizes, from two inches inclusive are furnished. These taps render it unnecessary to reverse the machines at all, making a great saving of time. The taps are so arranged that when they have reached the required depth, for which they have been properly adjusted, the cutters are instantly released from cutting by being drawn in, thereby causing the spindle to slide back by means of a weight; and, in so doing, reset themselves, so that only a forward movement again is necessary to bring them into the fitting. In this way nearly one-half of the time is saved over the old way.

All the shafts of these machines are of steel, and the gears are cut so as to secure accuracy of operation. The machines are made by E. J. Manville, Waterbury, Conn.

A Kansas inventor tries to tempt us with an enticing offer to find him a customer for a patent hot water jet arrangement, to be placed on locomotives for frightening stock off the track. Although an accompanying illustrated circular represents a herd of wild steers making terrified haste to get away from the track, under the convincing behest of a stream of hot water thrown among them from an approaching engine, we are disposed to think the patent would hardly prove valuable in actual practice. We would hardly care to recommend that more pipe attachments should be crowded upon the already overburdened locomotive, for use on a device whose success is very doubtful.

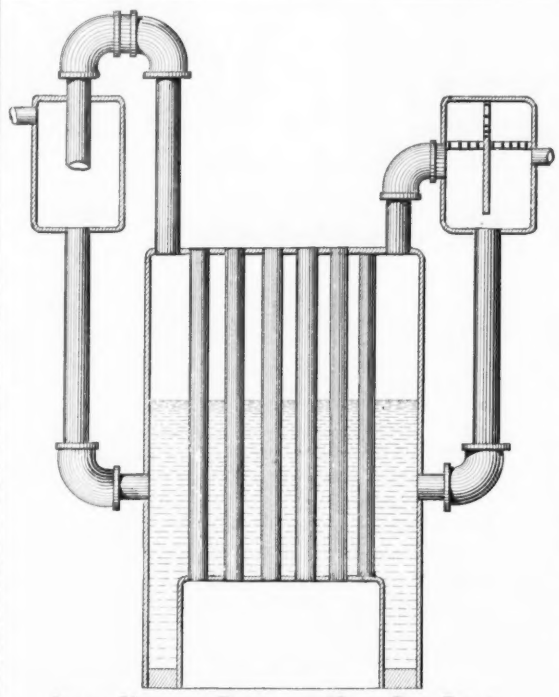
Dry Steam from Small Vertical Boilers.

Having received several inquiries regarding a remedy for priming of small vertical boilers, we wrote Mr. James H. Blessing, of Albany, N. Y., for a rough sketch of the plan we remembered him to have employed some years ago, and he courteously furnished the sketch which suggested the engraving shown. The engraving is not to scale, but serves quite as well to illustrate the plan.

Mr. Blessing writes, substantially: I have shown in the sketch two attachments on one boiler. The one on the left-hand may be used where there is plenty of head room; the one on the right where head room is limited. The operation, to my mind, is something like this: In small upright boilers, the surface for the liberation of steam, being small compared with the heating surface, and the steam room being limited, in drawing steam from them the pressure is lessened and the heated water flashes rapidly into steam. This steam naturally goes in the direction of the outlet from the boiler, and as its current is rapid it will carry along with it a great deal of water. Now, place the small tank, as shown at the left-hand, and connect the steam pipe from the boiler, letting it extend down, say half the length of the tank, then make the connection shown with the water space in the boiler. The steam pipe to engine should enter tank at the side near the top. I think the operation will be that the particles of water being heavier than the steam, will, having imparted to them a part of the velocity of the steam, pass on in the direction of the connecting pipe, and the steam as it enters the tank, losing its velocity, the water will flow by gravity back to the boiler.

In the one on the right-hand, a diaphragm is shown for the purpose of stopping the water. The upper side of this diaphragm, above where the steam and water strike it, should be pierced with holes so the steam will readily pass through. The steam pipe to engine should be taken out at the side, as indicated in the sketch.

In all cases the steam pipe from the boiler to the tank should have twice the area of that from tank to engine.



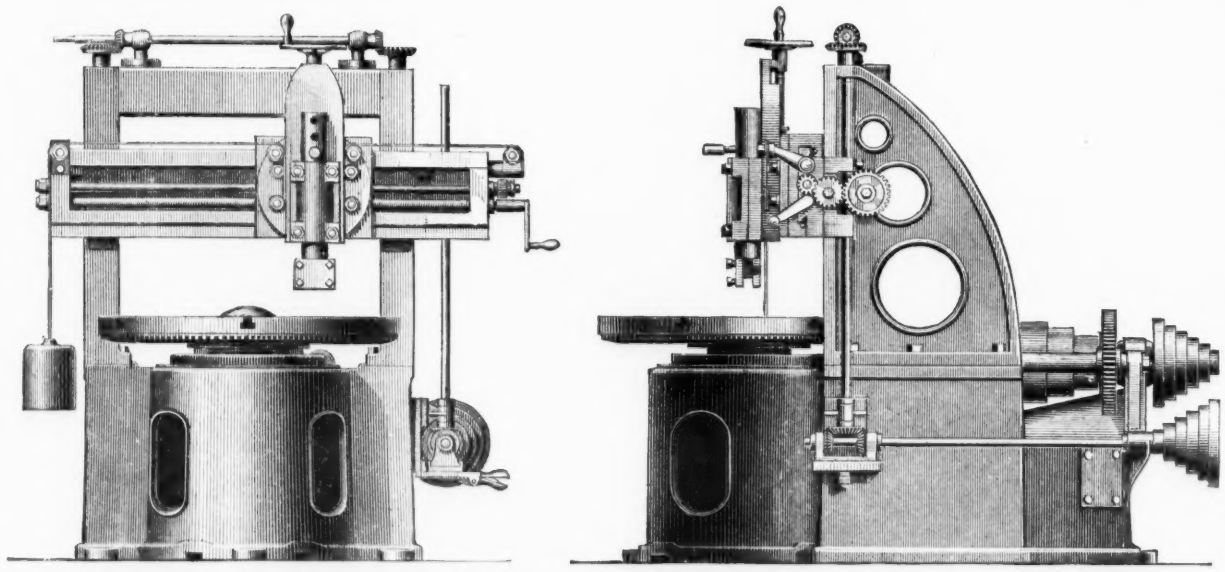
SMALL VERTICAL BOILER TO MAKE DRY STEAM.

Cotton seed oil mills have become so numerous in Texas that there is a scramble in some localities to get enough seed to keep them going. Cotton seed is selling in Galveston at $9 a ton and upwards, and a local paper says: "If the oil mills can stand it, the producers of cotton seed have no just cause for complaint."

The *Boston Commercial Bulletin* says: The business of making wooden houses in the United States for custom sale is stimulated by a brisk demand for these products in Brazil. Several large shipments have been made to Rio Janeiro, and they were all sold soon after their arrival. Fifteen hundred of these have already been erected in the new City of La Plata, the new capital of the province of Buenos Ayres.

Boring and Turning Mill.

On this page we show by two views a new Bridgeport 37-inch boring and turning mill. This machine was designed to meet the demand for a small boring mill, capable of working rapidly on material within its capacity, and the aim of the maker has been to combine high power with structural rigidity in a small tool. The tool is intended for boring, turning and facing gears, pulleys, cylinder-heads, and a great variety of work usually done on the lathe, but which can be done to better advantage on a tool of this description, owing to the convenience of setting and the great range of power and feed. While the tool shows the result of excellence throughout, there are a few points that deserve special mention. The table spindle is very long, is six inches diameter in the main body, and 4½ inches in the lower part. The upper resting part of this spindle is tapered at an angle of 45°, and rests on a babbit ring, which endures the whole vertical and lateral wear. By this arrangement the table itself compensates for wear, and, guided by the spindle, drops down in the central position. Should a solid metal block, of the full size that the tool will take in, be placed upon the table, the cone will be subjected only to one-fourth of the strain it is designed to resist. The boring mill has ten speeds from two to fifty revolutions per minute; the proportion of gear is thirty-six to one. It bores and turns at any angle, and the vertical movement of sliding-head is thirteen inches. All the nuts are case-hardened, and all the sliding parts scraped to a fit. The tool is made by E. P. Bullard, 14 Dey Street, New York.



NEW BORING AND TURNING MILL.

Deciding Against a Gauge.

A recent Washington dispatch to the New York *Times* says: Some time ago the Edson Recording and Alarm Gauge Company applied to the Board of Supervising Inspectors of Steam Vessels for its formal approval of the gauge manufactured and controlled by the company. The Revised Statutes of the United States require that local inspectors shall satisfy themselves that "suitable steam registers that will correctly record each excess of steam carried above the prescribed point and the highest point attained" are attached to the boilers of each vessel examined. These must be wholly out of the control of any person engaged in navigating the vessel and secured by the inspectors. They must be approved by the Board of Supervising Inspectors and also by the Secretary of the Treasury. The Edson company claims that its gauge is the only one meeting these requirements, and hence the application for approval by the authorities.

The board investigated the matter and declined to approve the gauge. Then the company laid its claims before the Secretary of the Treasury, and by him the matter was referred to the Solicitor of the Treasury, with instructions to report his findings to the Secretary. To-day the Solicitor made a report, fully concurring in the decision of the Board of Inspectors. He holds that the gauge called for by law must be such that it can be so secured by the local inspectors that it cannot be tampered with; that is, it must be substantially automatic. The Edson gauge is not, he says, of this kind. The Solicitor also finds the Secretary of the Treasury cannot approve of the gauge until it has been approved by the board, and has no power to control the discretion of the board. As the Edson gauge now sells at $100, the value to the company of a decision which would require the gauge to be placed on every boiler in every steam vessel is apparent. It is not expected that the company will drop the matter until it has made an effort to have the Solicitor's finding overruled by the Attorney-General, to whom an appeal will probably be made. The result of such an appeal will be awaited with great interest by all steamboat men.

We can perceive no reason, if the Government should make it compulsory for owners of steam vessels to use an automatic recording gauge, why the Edson gauge should be preferred to others. There are several gauges of this kind in the market that have become popular with steam users on their own merits alone.

We clip the following paragraph (which we fully indorse) from the *Locomotive*, published by the Hartford Boiler Insurance Company:

It is amusing, if not instructive, to follow the discussions which sometimes occur between men on mechanical subjects, such, for example, as steam boilers. The remarkable difference of opinion which is manifested on the simplest point, is simply amazing. These discussions are generally carried on by men who claim to speak from the standpoint of practical experience, but it will often be found their experience has been limited to some particular line of business, or some special type of boiler, so that they are wholly incompetent to express an intelligent opinion on a broad subject, however honest they may be in their conviction.

The steam boiler has probably been the subject of more thought, discussion, patents, and abuse in its construction and management than any other one thing under the sun, with the single exception, possibly, of a presidential candidate. Some insist on laying a boiler horizontally, others are equally certain a boiler should always stand on end, while another great and brilliant portion of the engineering fraternity, who are evidently on the fence, insist on setting boilers in an inclined position, while the degrees of inclination given by different parties embrace all the angles of the quadrant, and several more besides. Some with a view evidently of having the correct thing anyhow, combine all the different features and forms in the same boiler regardless of expense of first cost, economy of maintenance and operation, or the ridicule of intelligent mechanics.

As to fuel-saving devices their name is legion. It is no uncommon thing for one and the same party to have the agency of a patent setting guaranteed to save 25 per cent. of fuel, a grate bar to save 30 per cent. more, a damper regulator to save 10 or 15 more, a heater 40 or 50 more, pumps or injectors to save the remainder, and when they are all attached the man who owns the boiler, in nine cases out of ten, burns more coal than he did before they were applied. Many victims can testify to the truth of this statement. If we thoroughly examine the question from an independent standpoint we shall find that, generally, the efficiency and economy of a steam plant are in a direct ratio to its simplicity.

Agricultural Boilers.

BY GEORGE MARSHALL.

The alarming increase in the number of explosions belonging to that class of boilers known as the agricultural should lead, in my opinion, to serious reflection on the part of our lawmakers as to the best method to be employed whereby the same could be prevented, and the loss of life and property averted. To a practical man, observing the usual methods employed in the construction of boilers of this type, the wonder is not that they explode, but why more of them do not explode, as they are put together without any regard for the lives or safety of those who may run them, or who may be in their immediate vicinity when at work. From personal observation I can safely assert that many of these machines are deserving of the name of explosives, rather than steam boilers, and as the former are considered by all classes dangerous, the latter, as made by some of our agricultural engine builders, should receive the same classification, and be avoided by those desirous of preserving life and limb intact. At this season every year, the number of explosions is largely increased, owing to the fact that so many more of these machines are being used, on account of the rapidity and economy with which harvesting can be effected, as well as the scarcity of and high wages demanded by the laborers employed in agricultural pursuits, and also to the fact that a knowledge of steam, the steam engine or boiler, is not considered a necessary qualification on the part of the owner in selecting a suitable person to take charge of the machinery.

With the introduction into our governmental affairs of a Commissioner of Labor Statistics, it is to be hoped that in future a record of all such explosions will be kept, with the name of the boiler builder and the possible or probable cause of the explosion, and the publication of these statistics, with the weather reports, for the benefit of the mechanical and agricultural classes. In addition to this I would also add another suggestion: That the legislatures of the several States institute an inquiry into the causes of explosions occurring within their State limits, and exclude from their territory those makes which were proven the most destructive by reason of imperfect construction. The competition among builders of this class of work is increasing very

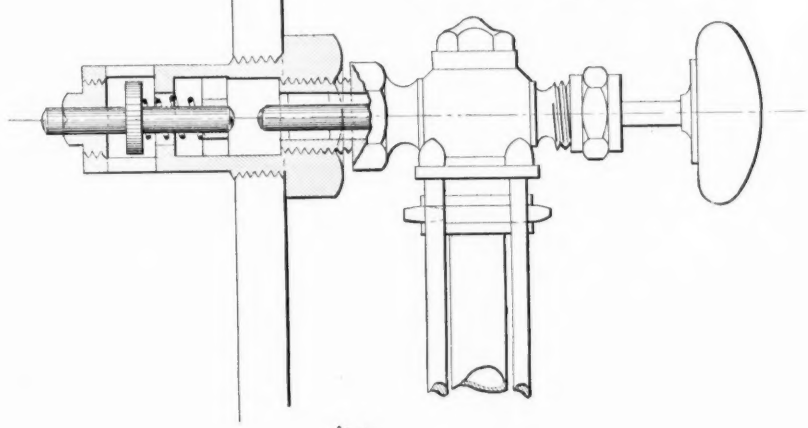
rapidly, and I grieve to say that the larger and wealthier houses are offering such inducements to intending purchasers, by long time and easy payments, that the smaller concerns can only depend on sales by the closest attention being given to perfection of work, purchase of best material, and employment of first-class labor. This, of necessity, reduces the profits of the small manufacturer to a minimum, while the wealth, reputation (often undeserved), and increased production of the heavy manufacturer enable the latter, by resort to cheap labor and improved machinery, to maintain his profits at the usual standard.

I have lately had opportunity to closely examine the work of different builders, placed side by side, and while, in many cases, the application of paint (like charity) covered a multitude of sins, unnoticed by the unmechanical observer, the preference as to safety was vastly in favor of the more unassuming make. In the shop of limited production and resources the employment of an artist and decorator of ability could not be afforded, hence a plain appearing machine; while in the large concern the services of both artist and decorator were considered essential, as both could be kept profitably employed. Competitive tests of these machines are annually made at State and county fairs, but in these tests there is nothing tending to enhance the safety of the purchaser, evaporative efficiency and economy being the only standard of excellence inquired into by the committee of "*experts*" appointed to pass opinion on the merits of the machines. A skilled, intelligent workman, witnessing an exhibition of this kind, will look beyond the tests—to the construction—and a preference will be given, not to the "diploma" or medaled engine and boiler, but rather to that in which the staybolts and braces are properly arranged with a due regard to safety, and the quality of material and workmanship are considered from a standard of excellence. In recent critical observations I found the quality of material used by different makers to vary considerably; in some cases the shell of boiler would consist of refined iron, fire-box of same quality, and heads of flange; in others, an advance in case of shell and fire-box to the shell grade; in still others, an advance to the flange quality for shell, and extra fire-box for the fire-box plates. In some cases the staybolts were placed from six and one-half to seven-inch centers, while in others the distance did not exceed four and one-half inches. When it is understood that each boiler is supposed to be capable of carrying the same pressure per square inch, your readers will understand the diversity of opinion prevailing among the builders as to what constitutes the point of safety.

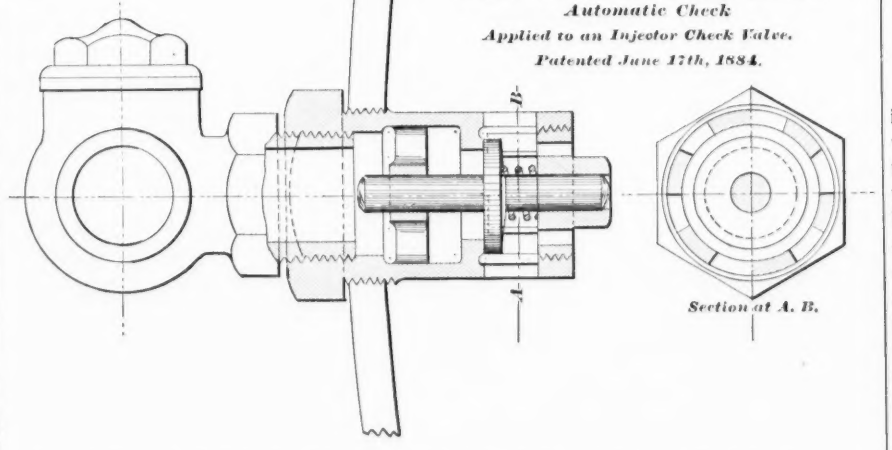
The most favorable impression was created in favor of an establishment whose capacity, or rather output, was about forty engines a year; the most unfavorable impression, of a house long established, with unlimited capacity, whose work was depreciating every year, but whose wealth enabled them to offer their machines on long time and their established reputation, rather than their willingness and ability to maintain the quality of their work up to the standard of excellence adopted by less wealthy but more conscientious firms. While it is undeniably true that a large percentage of the explosions occurring in this class of boilers can be traced to the ignorance and criminal neglect of those in charge, it is no less true that imperfect construction is more freely indulged in by manufacturers of this type of boilers than of any other type at present in use. The reason of this is apparent: In the large number of boilers of this class annually produced, and the competition among builders, resort is had to the cheapest grade of material and the poorest class of labor, skilled mechanics being the exception rather than the rule; the smaller shops usually employing a larger percentage of skilled workmen than their wealthier rivals, and depending more upon the merits in material and construction of their machines to effect a sale than upon elaborate and artistical art works so freely used in decorating engines and boilers of this class.

I had occasion lately to pass a few hours in the works of a small concern making a specialty of agricultural machinery, and while there my attention was called to the condition of one of these boilers, made by the firm whose works I was visiting, the tubes of which were reported by the owner as leaky and not to be made tight. Of course, the foreman of the boiler shop was called upon to make an examination, and the examination revealed the fact that the boiler had been in use for five seasons; in that time not one of the hand-hole plates had been removed, and the cylindrical shell and water bottom of wagon-top were full of scale, which the changes of water in the five years of service had made, necessitating the removal of the entire set of tubes to clean the shell part, while in the case of the water bottom, as well as shell, chisels and steel crowbars had to be driven in with a sledge to break up the incrustations which had formed. If the scale on tubes and heating surfaces caused the increase in fuel consumption which we are taught to believe and so frequently read of, then, in this case, the consumption should have been increased at least *five hundred per cent.*, and the power decreased in a corresponding ratio, as it seemed an impossibility for water to come in contact with any part of the tube fire surface, consequently reducing the heating surface and power of the boiler.

JERROLD & BURGERMEISTER'S
Automatic Check Applied to a Glass Gauge.
Patented June 17th, 1884.



JERROLD & BURGERMEISTER'S
Automatic Check
Applied to an Injector Check Valve.
Patented June 17th, 1884.



Traction engines are run over grades of every degree with low water in the boiler; this frequently causes a burning of the crown sheet or tubes, yet nine times out of ten the builder will be blamed for defective work, when the blame and responsibility should be placed on the shoulders of the "coal shoveler" who has charge of the machine. In moving these machines from farm to farm the same degree of carelessness is manifested, fires being kept burning brightly, no attention being given to the quantity of water in the boiler—this neglect, in connection with improper construction, resulting in the large percentage of explosions of threshing machine boilers. For years it has been the study of inventors to produce, among other things, a steam boiler, which could be made of the holder being required in the case of portable engines. Of course, the use of the license should be limited to the State in which it is issued.

The efforts of the National Society of Stationary Engineers should be directed to subjects of this nature, and with the aid of papers devoted to the interests of steam and steam users, as well as that of the American Society of Mechanical Engineers, great good in this way could be accomplished at the annual sessions of legislatures in the several States. It requires harmony of action and considerable care in the preparation of suitable laws to insure success. The rights of the several inspection and insurance companies should be considered, as much of the agitation in matters of this kind, as well as reforms effected in the past fifteen years, can be directly traced to the exposure of imperfect methods of boiler construction and improper care of boiler plant published in season by the Hartford Inspection and Insurance Company, which is here named, not with disrespect to similar companies now in existence, but for the fact that it was the pioneer in this enterprise, and its publications, so extensive, are valued by practical men wherever received.

The insurance companies, while doing a good work, are still handicapped in their reform efforts, as they have no power to insist on good material and good workmanship, except in isolated cases, where the plans are prepared by them and the acceptance of the boiler depends on their inspection and acceptance. It is true that the insurance companies can and do increase their premium rates in proportion to the condition of the boiler, but the risks carried by insurance companies in proportion to boilers in use being so small, even if they had full power in every case where insurance was effected, it would hardly be noticed in the general result. Some steam users will not insure their boilers, because they know they will not pass the necessary inspection; this class of men do not want any inspection laws passed or enforced, and they are usually found in the front rank of those opposing measures of safety which may be suggested to prevent loss of life and property by reason of boiler explosions. Insurance companies rarely, if ever, take risks on agricultural engines, as they cannot be reached at all times for inspection, and the ability of the men employed in running them is hardly up to the standard where an insurance risk is desired.

In some of the boilers referred to tubes are run from front to back heads over the fire-box, the idea being to increase the capacity, without increasing the size, by means of these tubes; the additional tubes, while in a manner accomplishing the desired result, are so placed in connection with the shell that they will in time prove an annoyance and expense to their owners, since there is not room enough left between shell and tubes to allow a free circulation of the water. The result will be, in a short time, leaky tubes, impossible to tighten without a removal of the tubes and cleaning away of the sediment. Matters of this kind receive no attention from ordinary purchasers, as they, as a rule, possess no mechanical knowledge, and their judgment is more apt to be governed by the attraction of paint and decoration than by attention to mechanical qualities.

Jerrold & Burgermeister's Automatic Steam Valves.

On this page we present engravings showing sections of an automatic safety check valve and water-glass cocks intended for locomotive use. Accidents to locomotives, that otherwise would have passed off harmlessly, have so often resulted in fatal scalding through boiler attachments being broken off, that any means of reducing this source of danger is welcome to men engaged in railroad train service. These boiler attachments are so designed that the valve operates from the inside, and breakage of the connection results in closing up the opening. A good feature about this device is that its construction enables the whole attachment to be taken out easily when any necessity arises for examining the valve. When water-glass cocks are kept in good order there is seldom any trouble in shutting off the rush of water and steam when a glass breaks, but occasionally painful burns are sustained from this accident even when the engineer is capable and has kept the cocks in shutting order. A device which shuts off the steam automatically will perform valuable service to steam users. The device is patented and manufactured by Jerrold & Burgermeister, box 709, Pittsburgh, Pa.

The American Street Railway Association will hold its annual convention in New York, October 15.

Owing to the unsettled state of affairs just now it is not probable that any railroads will be built in Texas for a number of years, outside of the extension of the Gulf, Colorado and Santa Fe, and the completion of the link between Garrett and Paris by Huntington.—*Fort Worth Gazette.*

LETTERS FROM PRACTICAL MEN.

The Ellis Boiler.

Editor American Machinist:

Referring to your issue of April 5th, 1884, containing a cut and description of the "Fitzgibbon boiler," I beg leave to hand you, in connection therewith, the original tracing, dated April 3d, 1860, (somewhat dilapidated by use and age), of a boiler designed by Mr. Wm. M. Ellis, who at one time, I believe, was master machinist at the Washington Navy Yard, and later proprietor of the Eagle Iron Works, in the same city. This tracing was made by Mr. Ellis for Mr. A. B. Cooley, of Philadelphia, who desired to have the boiler made for trial upon one of his dredging machines.

The order was given to the Port Richmond Iron Works of Messrs. I. P. Morris & Co., who constructed the boiler, and placed it on board the dredge.

After an extended trial, the expected econ omy of fuel was not realized, as its performance was no better, due probably to the sluggish circulation, than that of the ordinary locomotive-type boilers in use upon the other dredges, and having about the same amount of flat and tubulous heating surface; and, as it was more expensive to build and keep in good condition, no more of that type were built for Mr. Cooley, nor do I now know of any made for others, although it is likely that some were.

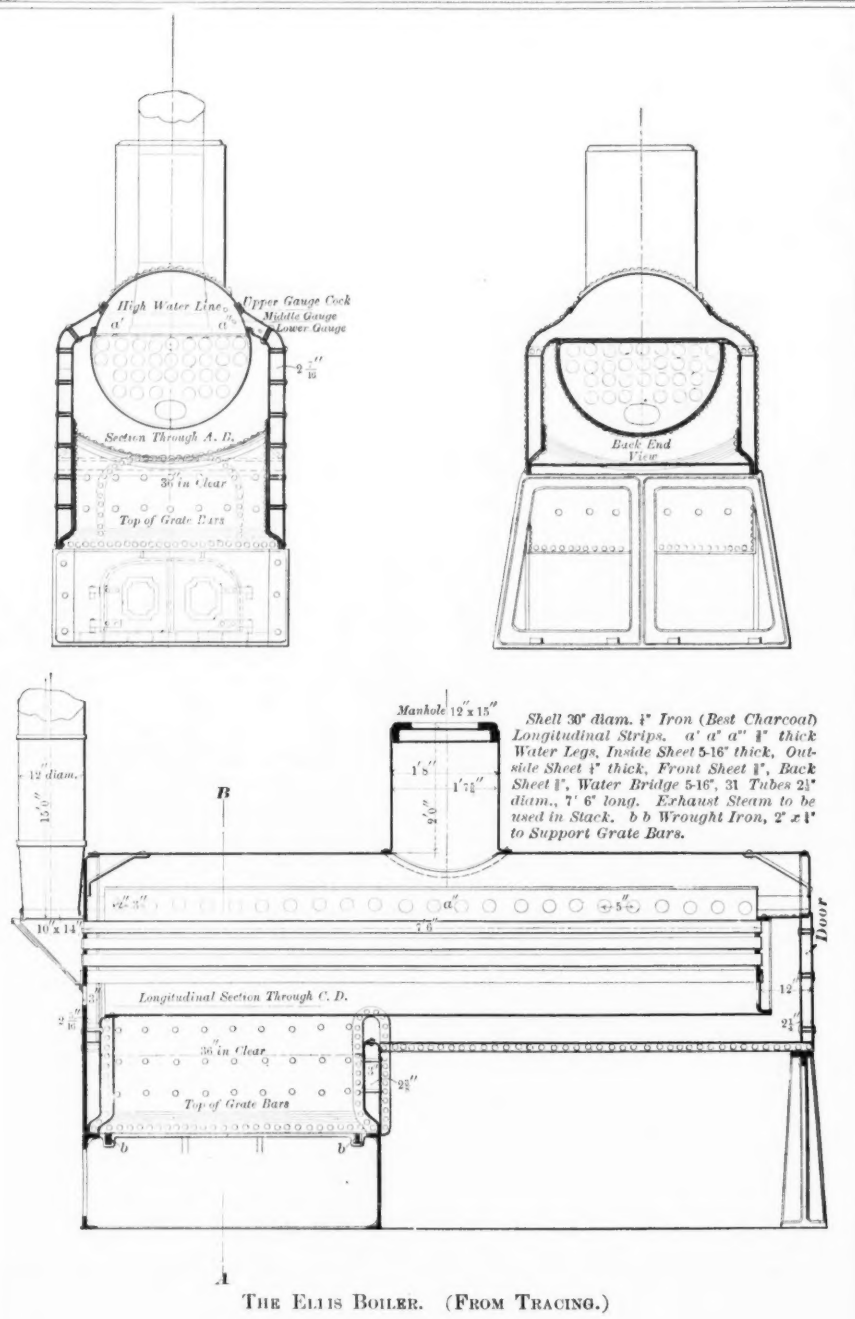
It will be noticed that the principal difference between the "Ellis" and "Fitzgibbon" is the addition to the latter of a water bottom; but it is questionable whether that serves any other purpose than that of a tie for the legs. Its value as heating surface must be inconsiderable, even before it would get covered with fine ashes or soot, and its comparatively flat and level surface affords no facility for the escape of steam bubbles to give place to a new supply of water.

It may induce circulation by affording a channel from the water space of back-box to the bridge wall and to the legs, but, as the back-box must necessarily be at a high temperature, and therefore much steam produced in the adjacent water spaces, opposing currents must result. This latter evil could be remedied by increasing the back-water space, and by the use of one or two vertical tubes of large diameter—say, 12 inches—to connect the water bottom with the lowest portion of the cylindrical body. These latter would permit sediment to be precipitated to the water bottom, and thence blown out.

The cut of the "Fitzgibbons" boiler does not clearly show how communication is had between the side legs and the cylindrical part for the passage of steam, and it has been assumed that the same means are used as that shown in the "Ellis" boiler, *i. e.*, a series of circular perforations where the legs join the shell. The shell is reinforced where the material is cut out by strip of metal, shown at *a a*, riveted inside the shell above and below the perforations. It will be of interest to know what the evaporative efficiency of the "Fitzgibbon" boiler is.

WASHINGTON JONES.

Philadelphia, Pa.


High Water Line
Upper Gauge Cock
Middle Gauge
Lower Gauge
Section Through A. B.
36" in Clear
Top of Grate Bars
Back End View
Manhole 12" x 15"
Shell 30" diam. ⅜" Iron (Best Charcoal) Longitudinal Strips. a' a" a"' ⅜" thick Water Legs, Inside Sheet 5-16" thick, Outside Sheet ¼" thick, Front Sheet ⅜", Back Sheet ⅜", Water Bridge 5-16", 31 Tubes 2½" diam., 7' 6" long. Exhaust Steam to be used in Stack. b b Wrought Iron, 2" x ¼" to Support Grate Bars.
12" diam.
15' 0"
B
10" x 14"
Door
Longitudinal Section Through C. D.
36" in Clear
Top of Grate Bars
A

THE ELLIS BOILER. (FROM TRACING.)

Proportioning Steam Ports and Slide Valves.

Editor American Machinist:

I have noticed among the "Questions" the very frequent repetition, in one form or another, of the proper proportions of ports for different sized cylinders for steam engines.

Having had a somewhat extended experience in designing and building engines, I will give my practice, or rather rule for the simple slide-valve cutting off at three-quarters' stroke, which I think may be helpful.

I make area of steam port $\frac{1}{18}$ of area of cylinder, and the exhaust port 50% larger, at least. Having decided the area of ports, then make dimensions of length and width, according to circumstances; as, for instance, if it be a horizontal engine, with steam chest at side, it is best to place ports so that lower edge shall be on line with bottom of cylinder bore; this secures good drainage of cylinder.

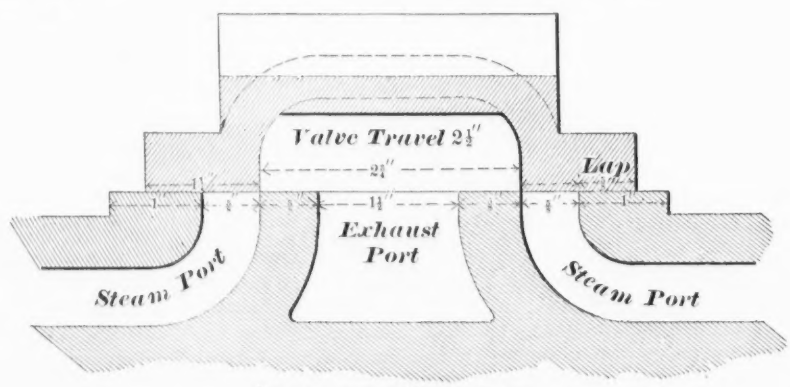
Having decided my dimensions of steam port, I call the opening unity and make the lap, with an average cut-off at three-quarters of stroke.

Take an engine with cylinder 10" bore, the area of cylinder is 78.54[]", area of steam port 5¼[]", which will give a port ⅝" wide x 8½" long. Exhaust ports I would make 1½" wide, which is more than double the steam port (I gave the 50% rule as least permissible dimension). Lap of valve ⅝", and travel of valve 2½". In ordinary practice I do not give any inside lap, but make it line and line when valve is central. The accompanying diagram will help to explain.

Hoping the above may be of use, I remain,

C. C. COLLINS.

Newark, N. J.



PROPORTIONING STEAM PORTS.

Waste of Fuel from Light Loads.

Editor American Machinist:

Having read the article on "Waste of Fuel from Light Loads" (September 6, 1884), I beg to call your attention to one little item, which "Engineer" seems to have overlooked, viz., the resistance of the air on the piston, or the pumping against the air pressure, as it were. (I presume that "Engineer" had reference to non-condensing engines.)

Neglecting the additional friction a larger engine has, I will attempt to show where the saving of fuel came from, in addition to the saving from the reduced internal condensation. Assuming an engine to have 160 square inches of piston area, 500 feet piston speed will give 80 horse-power, with 33 lbs. mean effective pressure; and an engine with the same piston speed and mean effective pressure will require 50 square inches of piston area to 25 horse-power. Should the larger engine be loaded with only 25 horse-power, it will require about 10 lbs. mean effective pressure.

Non-condensing engines have a back pressure of, say, 16 lbs. Add this to the above 10 lbs., and you have actual mean pressure of steam on piston = 26 lbs., and the work performed by the steam =

$$\frac{26 \times 160 \text{ (area of piston)} \times 500 \text{ piston speed)}}{33000}$$

= 63 horse-power. Doing the same effectual work (*i. e.*, 25 horse-power) with the smaller engine, it required 33 lbs. mean effective pressure, as stated above. Add, again, 16 lbs. back pressure, and you have actual work performed by the steam =

$$\frac{49 \times 50 \text{ (area of piston)} \times 500 \text{ (piston speed)}}{33000}$$

= 34 horse-power—a difference of 29 horse-power = 46 per cent. in favor of the smaller engine.

As the decrease of friction (by putting in a smaller engine) has undoubtedly also saved some coal, and, as "Engineer" states that only 50 per cent. of the coal was saved, I am inclined to believe that the saving on account of having less internal condensation is not quite as large as "Engineer" thinks. I am aware that the internal condensation by high expansion is considerable at the beginning of the stroke, owing to the lower temperature of the cylinder; but is not a large portion of this same heat (which is now being stored in the metal of the cylinder) reconverted again into work towards the end of the stroke? Of course, you will say, this will raise the terminal pressure. True; but, in spite of it, the terminal pressure will be much below the terminal pressure of a smaller engine using the same initial pressure and small expansion. Consequently, the heat units carried away by the exhaust steam must be less for the same weight of steam. A larger cylinder, of course, offers more surface for external radiation than a smaller one, but this is counteracted again to some extent by its having a lower mean temperature. I do not dispute that internal condensation is injurious to the economical working of the steam engine, but I believe that the amount of the injury has been greatly overrated, and to attribute the waste of fuel from light loads to cylinder condensation alone is a mistake, to say the least, as it is rather small in comparison to the additional work a larger piston has to do in working against the atmosphere, and an 80 horse-power engine has considerable more friction to overcome than a 25 horse-power engine.

G. S.

Reading, Pa.

Driving Boxes and Wedges.

Editor American Machinist:

A correspondent, writing in your issue of August 30, and referring to a previous article of mine, mentions the trouble caused by the unequal thickness of the driving-box flanges when the boxes are changed round, or the wedge and shoe changed to opposite sides, to obtain a good bearing for the wheel hub. It would hardly be expected, where it is the practice to change boxes and wedges for the above purpose, that the important matter of the proper thickness of the box-and-wedge flanges, or that required to bring the crank-pins in line with each other, and the main pin bearing in line with the cylinder, would be neglected. A bad hub-bearing is an evil, inasmuch as it allows a rapid wearing away of the face of the box and the hub of the wheel until they come to a bearing, this wear causing much lateral motion. But remedying it by reversing the box and wedges, without attending to the effect the change may make in the position of the wheels and pins, might be remedying one evil by creating one that was greater. In the first case, the face of the box and hub of the wheel only are affected; in the latter, the main and side-rods, crank-pin, cross-head and piston rods are all sufferers.

When power is applied through a mechanical medium, its tendency is to act in a straight line, and, when the means through which it is applied deviate from the straight line, the tendency is to resume the straight line, and anything which resists its doing so has a strain put upon it whose force is in proportion to the angle or bend it may make on the line.

In the case of the locomotive, when the power from the cylinders is applied to the driving wheel by means of the piston and other connections, it is important that the center of the main rod bearing on the crank-pin shall be kept working on a vertical plane in line with the center of the cylinder, and that the center of the driving axle be maintained at right angles to that plane. Driving-box and wedge flanges perform important functions in keeping the crank-pin revolving in its proper path, and they must be of the correct thickness to do their work properly. Should the center of the main bearing be inside the center line of the cylinder during all or any part of its revolution, an angular movement is the result, and the line from the piston to the crank-pin is not direct. A pull upon the rod will tend to make the

crooked line of strain straight, and, where four bar guides are used, will force the cross-head against the inside guide and the piston rod on to the side of the gland. When the cross-head is pushing on the guide, the latter acts as a fulcrum, over which the power pulls the rod outward and on to the outside collar of the pin. The opposite will be the result when the power pushes upon the rod. The alternate action of pulling and pushing on a rod out of line causes the brass and the collar of the pin to wear rapidly, and these parts will continue to be cut down until enough has been worn off to bring the rod into line with the cylinder. The alternate inward and outward movement of a cross-bead, so often seen on locomotives, is generally caused by the crank-pin's path being out of line with the cylinder, and the defect is very destructive to the moving parts.

In the foregoing I have assumed that the pin has been put out of its proper path by the flanges of boxes and wedges not being of the correct thickness. The same result will, however, sometimes be produced by squaring the wedges from the center casting for the truck. If the truck center casting were central with the center line of each cylinder, and the axles set at right angles to these three parallel lines, the path of the crank-pin will be in line with the cylinder, but in many cases the truck casting is not central, and driving boxes and wedges, fitted on the assumption that the casting is central, are liable to put the crank-pins out of their proper path. Owing to this uncertainty about the truck casting, it is best to square the wedges with the center line of the cylinders, and, if necessary for tracking, the truck casting can be moved. When this casting is put right, and the wheels do not track properly, the condition of the average truck will furnish grounds wherein to look for the cause of trouble.

J. D. CAMPBELL.

To Determine the Travel of Automatic Slide Valves—Small Steam Port Openings.

Editor American Machinist:

I have great misgivings as to the advisability of continuing these valve diagrams any further, because there is such a large proportion of your practical readers who have no direct interest in the valves of automatic steam engines; and, to a large part of those who have, a diagram such as shown in Fig. 7 is all Greek. The subject is continued on the assurance that some of your readers are following with interest. Those who have not followed the former explanations and understand thoroughly every step, will be likely to get confused; and my advice to those is either to throw this aside altogether, or to go back and study the former letters until they are fully understood.

By a drawing of the character of Fig. 7 it is easy to determine the travel and the width of port opening an automatic slide valve will give, when cutting off at different points, as is the case with the single valve automatic engines.

Assume that the valve at its greatest travel is cutting off at three-quarter stroke, and has a travel equal to the diameter of the outside circle shown in Fig. 7. The first part of the diagram is drawn the same as in all former figures. The circle *A* has a diameter equal to the greatest travel of the valve. On the line *B*, three-fourths of its length from *C*, is drawn the vertical line *D*, and the small circle at *C* is equal in radius to the lead of the valve. The line *F*, drawn from the circle *C* to *F*, determines the lap of the valve, which is shown by the radius of the circle *G*, which cuts line *F*.

To determine the width of port opening and travel with the same valve, cutting off at three-eighth stroke, draw the vertical line *H* at the three-eighth point, and the diagonal *N*. From the point *I* draw the diagonal *J* so as to cut the lead circle *C*. Parallel with the line *J* draw the line *K* to strike circle *G*, and from the point where the line *K* strikes the line *N* draw the circle *L*, and the diameter of this circle will be the travel of the valve, and the distance from the line *K*, at *a*, to *b*, on the circle *L*, will be the width of port opening.

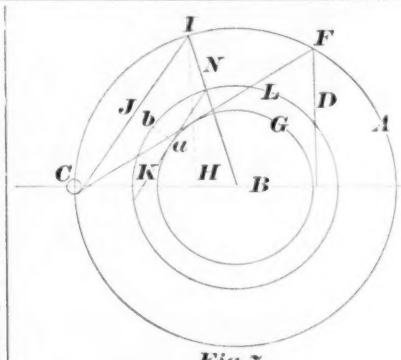


Fig. 7

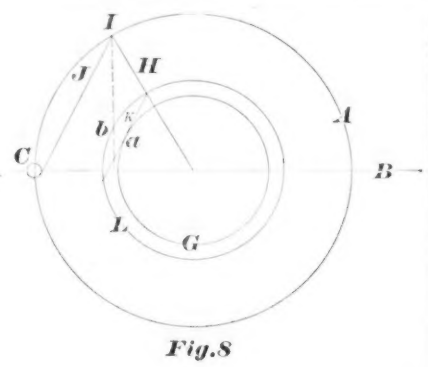


Fig. 8

The most casual observer will at once notice how small this opening becomes when the diagram is drawn for one-quarter cut-off, as is the case in Fig. 8, and it is this that is believed to be one of the serious difficulties when cutting off short with a plain slide valve. With a slide valve large enough, and with enough travel to get sufficient port opening, it becomes a question whether the saving in steam equals the loss in power used to move the valve. Still, nearly all locomotives with the link motion are plain slide valves, cutting off at various points down as short as one-fourth, probably; and so the statement often made "that it is not practical to cut off with a common slide valve shorter than about five-eighth or three-quarter stroke" would seem to be disputed by the general locomotive and automatic engine practice.

The study of this question will, I think, lead to a more realizing sense of the difference between port opening and what is often, if not generally, understood as port. From the fact that an engine will get steam enough to keep up the pressure in a cylinder through a $\frac{1}{4}$" port opening, it does not follow that a $\frac{1}{4}$" port and passage is large enough for the same purpose. The passages must be either very short, or very much larger than the port opening, or a reduction of pressure in the cylinder will be the result. The reduction of pressure must be due to friction, and as a thin, wide passage offers a much larger amount of friction surface than a thick, narrow one of the same area, there is a possibility that there are cases where it pays to narrow and thicken the passages.

JOHN E. SWEET.

Exchange of Information on Foundry Matters.

Editor American Machinist:

Articles published in your journal on foundry practice, throw light on a trade that needs it, I believe, more than any other. While the art of moulding requires as high an order of mechanical skill as any of the mechanical branches, the moulder and his trade, when compared to other trades, *has stood* in the background in this progressive age. I say "has stood" for he has not been kept back, and it seems he has been contented in his position, and very little thought has been given him, while others "in this age of light and knowledge have pushed forward with gigantic strides."

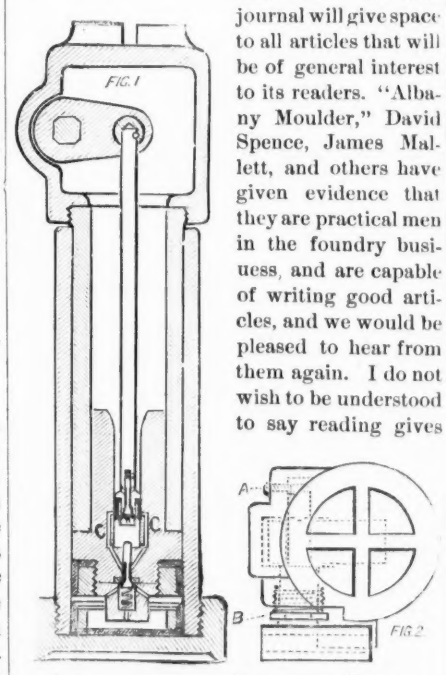
A little circumstance that happened last week will illustrate this; a party of gentlemen were looking at and admiring some large casting, upon which very little work had been done outside of the foundry. The inventor, designer, machinist, painter and all were spoken of, when one gentleman directly interested in a foundry, said, "I wonder how many people will look at this work and ever speak of the moulder who made these castings?" The reply was, "Oh! I never thought of that."

It has only been in the last several years that the moulder has had any help or information from mechanical journals, and this information has been most altogether from the columns of the AMERICAN MACHINIST, and the pen of Thomas D. West. I do not say this by way of flattery, but as a compliment well earned.

Occasionally we get accounts from other journals of some large mould being made, or casting poured off; but only from the columns of the AMERICAN MACHINIST do we get information of every-day foundry work and appliances. I have, I believe, about all the works that have been published that contain imformation on moulding and melting, and there is not one of them so applicable to practical purposes as West's "American Foundry Practice."

A foreman of one of the larger foundries down South, said to me, whenever he got puzzled about a piece of work he referred to "American Foundry Practice," and always found something to help him out, and he seemed anxious to procure a copy of the second volume, which I told him Mr. West would have ready about November of this year.

There are moulders all over this country who are capable of writing good, practical, useful articles if they would only make the effort. Some "stand in the background" because they are afraid of being criticized. We cannot all be of the same opinion, and criticisms, if they are made in a kindly spirit, only result in good to all. Others say, "Oh! every moulder in the country knows how to do that." That which may be old to you, will, no doubt, be new to many within the broad scope of the AMERICAN MACHINIST, and I feel sure that journal will give space to all articles that will be of general interest to its readers. "Albany Moulder," David Spence, James Mallett, and others have given evidence that they are practical men in the foundry business, and are capable of writing good articles, and we would be pleased to hear from them again. I do not wish to be understood to say reading gives practice by any means, but it suggests ideas which, if put into practice, often bring good results.



IMPROVEMENTS IN HYDRAULIC JACKS.

Mr. W. R. Brown, president of these works, says: "No one man can expect to learn two or three trades and expect to be thorough in any. There is not time enough in the average life of man. Concentration is what makes any one successful at a particular trade, and even then a man must read the experience of others and combine it with his own. I have always noticed the better informed a mechanic is through reading upon his trade, the more intelligent and better workman he is." Acting upon this idea, and with a desire to benefit the men, he has the writer distribute all the journals that come to him through the week (and they are about all the publications in the iron and machine interests) among the men on Saturday.

ROBERT E. MASTERS.

Columbus (Ga.) Iron Works.

Bronze Mixture for Cast Iron.

Editor American Machinist:

In your issue of September 6 a subscriber asks for a good bronze for cast iron. A year ago I obtained the following, which I think to be good: Take equal parts French yellow and petroleum oil; make thick as paint, and apply hot. If this is of any use to you, use it and welcome.

H. H. WOODRUFF.

Henderson, Ky.

Improvements in Hydraulic Jacks.

The annexed section cuts show some important improvements recently made on hydraulic jacks by Watson & Stillman (late E. Lyon & Co.), 468 Grand Street, New York. The object sought is to make their hydraulic jack simpler in details and more easily repaired than those previously made, by that means increasing their durability and making the jack more reliable. In order to obtain a reliable lubricated packing for the lever socket, and at the same time retain the flat lever, they have removed the set screw which held the socket in place from the inside to the outside of the head, as shown at *A*, Fig. 2, and behind the socket head a packing gland has been introduced, as seen at *B*, Fig. 2.

The advantage of having a lubricated packing will readily be appreciated by all who have experienced the recurring trouble with the ordinary hydraulic jack from the packing becoming dry. The automatic attachment for forcing the piston valve off its seat, which was in the old style, has been omitted entirely, and in lowering the filling is returned around the pump packing and valve to the upper part of the jack through passages in the walls of the pump, as shown at *C*, Fig. 1, thus avoiding the tearing and stripping of the packing as in previous attempts to avoid the use of lowering attachments. Solid and inflexible packings have been abandoned in favor of flexible cup packings both in pump and cylinder. Those using the new jacks report that they work with one-half or less of the friction that there is with the solid packings.

To avoid the trouble caused by attempting to repack the piston or regrind the piston valve without a lot of special tools for taking the jack entirely apart, the ram valve is now put in a plug which forms the bottom of the pump, and which, when the ram is pumped from the cylinder, may be removed and thus expose the lower end of the pump and allow the valve to be examined without taking the ram from the head. Another improvement allows the pump packing to be changed in the same method by slacking the set screw in the head and withdrawing the socket just far enough to revolve it past the lug, and thus push the packing through the pump.

In order to prevent the breaking of the pump where its shoulder joins the ram, the pipe of the ram is brought clear down to the packing, and the valve plug put in it by an interior thread, thus strengthening the ram at its weakest point.

Our thanks are due to the Board of Trade of Scranton, Pa., for a copy of the new Directory of that city. It also contains a full report of the business and manufacturing advantages of Scranton, and its desirableness as a place of residence. The information about burning anthracite culm, a cheap fuel, is worth the careful attention of steam users.

E. A. Beaman, for several years manager of the Star Tool Company, Providence, R. I., has withdrawn from that company and accepted a position with the Brown & Sharpe Manufacturing Company, of that city, as salesman. Mr. Beaman is well acquainted with requirements in the machine tool trade, and the facilities for meeting them. He has a large circle of friends in the machinery line.

The facility with which the banks of this country can be used by dishonest presidents, cashiers, and directors, reminds us of a little story. "An' phwat is yer son James doin' now, Mrs. O'Flaherty?" "Sure, an' he's become a great gintleman, wid such foine clothes on him ye'd not know him. He's in some bank, Mrs. O'Flanigan." "An' phwat bank is it?" "Faith, an' its the Fary Bank I belave they calls it." The difference between some of our banks of issue and deposit and our faro banks is more imaginary than real.—*Bulletin of the American Iron and Steel Association.*

Pit Lathe for Turning and Boring Large Wheels and Pulleys.

This machine of which we show a plan and elevation on this page, was designed and built by the Beckett & McDowell Manufacturing Company for use in their works at Arlington, N. J., where it can be seen in operation. This lathe will turn a pulley 14 feet diameter by 4 feet face, but its limit can easily be increased by lengthening the saddle girders, the working parts and headstock, etc., being amply strong enough to turn and face up to 16 or 18 feet diameter.

As will be seen on reference to the illustrations, the foundations consist of two cast iron box-girders resting on heavy masonry. These girders have a base 16 feet long by 2 feet 3 inches wide, and 9 inches deep, and carry the bridge castings and saddle bed, that support the turning rests. The center part of one of the girders rises 9 inches for a length of 4 feet, on which the front portion of the headstock is bolted, giving it an unusually large area of support. The bridge castings with their turning rests are moved in and out to their positions by suitable racks and pinions. The saddle bed, which carries the facing and boring rests, extends the full length of the girders below it and is fitted with a saddle rest which is moved by screw in the usual manner, so that once set the latter will face to the full capacity of the lathe without change or stoppage.

All the rest have screw beds, worked automatically from an overhead shaft, and cranks, driven by a gear on main spindle, and can feed at any desired angle. This lathe is well and strongly proportioned, and has a substantial and massive appearance. The driving cone has seven speeds for a 5-inch belt, the largest being 27 inches diameter. The gearing is cut from the solid, ensuring a smooth running machine.

The following are a few of the leading dimensions and weights:

Main journal of spindle 16″ dia. by 20″ long; extreme length of spindle, 8 feet; cone shaft, 3½″ to 4″ dia.; face plate, 8′ 8″ dia. by 5″ face by 2¼″ thick; base of headstock, 6′ 7″ long by 4 feet wide; height of headstock to center of spindle 3 feet.

	lbs.
Weight of Headstock	7,500
" " Face Plate and Rack	8,950
" " Spindle	3,200
" " Two Box Girders	9,500
" " Saddle Bed	4,500
" " Bridge Castings	9,000
" " Compound Facing Rest and Saddle	2,500
Weight of Compound Turning Rests and Columns	2,700
Total weight complete	50,000

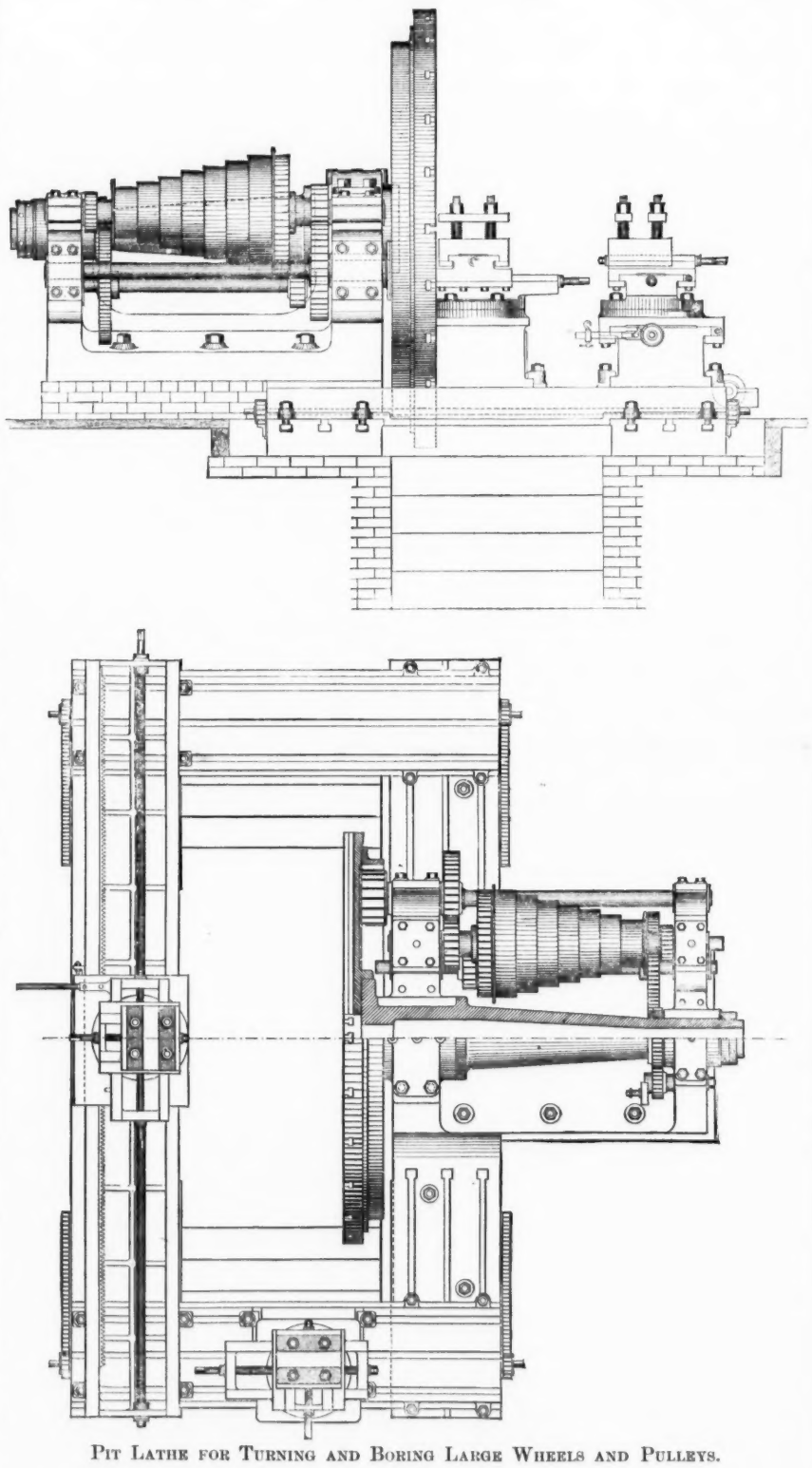
The annual convention of the National Association of Stationary Engineers met recently in Baltimore. There are about 2,000 members in the several local associations. President Beckerleg, in his address, strongly advocated agitation for the enactment of license laws for stationary engineers. He said:

"It is not only the engineers who ask for such a law, but their employers. Manufacturers and steam users recognize the necessity of such a law for the protection of life and property. You are all aware of the fact that the national Government does not allow an engineer to run any vessel propelled by steam until the said engineer has been regularly examined and licensed by the government officer appointed for that purpose. The only object the Government has in view is that of protecting the lives and property of its citizens, and we know no reason why our municipal and State authorities should not protect the lives and property of our citizens in our large cities and manufacturing establishments with the same fidelity that the national Government watches and guards the lives and property of the citizens when afloat. There are many reasons, well known to you all, why the State authorities should enact suitable laws for governing the examining and licensing of stationary engineers."

A committee of five was appointed to memorialize Congress to pass a license law. The following officers were elected: President, James G. Beckerleg, Chicago; Vice-President, R. J. Kilpatrick, South St. Louis, Mo.; Secretary, G. G. Miner, Cincinnati, Ohio; Treasurer, George M. Barker, Nashville, Tenn.; Conductor, John Trix, Detroit, Mich.; Doorkeeper, Napoleon W. Williams, Philadelphia.

A Rain Machine.

If a contrivance, a design of which has recently been submitted to the Australian minister for water supply, be successful, one of the greatest enemies of the farmer—drought—will to some extent be avoided. It is a machine for bringing down rain, and is in the form of a balloon, with a charge of dynamite underneath it. The balloon is to be sent into the clouds, and the dynamite is to be fired by a wire connecting it with the earth. It is the intention of the inventor to make a trial of the apparatus on the dry districts of New South Wales. Our own farmers and grazers, whose corn or flocks gasp in the parched regions beyond the "rain belt," would do well to keep this rain machine in mind. The only obstacle we see to its success as a substitute for irrigation in the arid districts of Colorado, New Mexico, and Arizona, is the fact that in these places, where water famines are constant, there are no clouds from which even the most persuasive dynamite could bring forth a drop of moisture. If some mechanical genius will now invent a machine to generate clouds in the places where they are conspicuously absent, those in need of water will readily learn to apply the dynamite method of milking the clouds.



PIT LATHE FOR TURNING AND BORING LARGE WHEELS AND PULLEYS.

Water for Locomotive Boilers.

BY ANGUS SINCLAIR.

SECOND PAPER.

LEARNING THE MANIPULATION OF TESTS.

Practice in making superficial qualitative tests of water, produces skill in reading the meaning of the various chemical reactions. This skill can be rapidly developed by practice on prepared specimens. Water for experiments on carbonate of lime can be prepared by dissolving calcite crystals or marble dust in hydrochloric acid, or by mixing chalk with clean rain water and filtering it till free from turbidity. While the chalk is mixed with the water and unfiltered, the specimen will be made stronger by blowing air from the lungs through a glass tube into the water. A preparation for testing sulphate of lime may be made by dissolving some gypsum in distilled water. Fluid magnesia dropped into pure water will provide carbonate of magnesia specimens; and Epsom salts will give the magnesia reaction with the addition that it will indicate sulphuric acid under the chloride of barium test. A grain of salt no larger than a pin head dropped into a pint of distilled water will give a distinct chlorine test when nitrate of silver solution is added. Stronger or even weaker salt solution can be used by the experimenter while he is working into practice. A small piece of sulphate of iron dissolved in water will provide a test for iron.

MAKING QUALITATIVE TESTS.

While pursuing the apprentice practice of tests with these solutions, care must be taken to have the test tubes perfectly clean. Go over the tests in something like the following order. The carbonate of lime test is to be made first. Four test tubes will be used. In the first we put distilled water alone, in the second we put ten drops of the chalk solution, in the third we put twenty drops of the solution, in the fourth we put thirty drops, then add distilled water till all the test tubes are about two-thirds filled. Drop into each tube about the same quantity of oxaltate of ammonia solution and the degree of turbidity will help to indicate the hardness of each specimen. The first tube containing pure water will give no reaction if the chemicals are pure.

This process should be extended to all the other solutions and will be found very helpful. In carrying out experiments of this kind, much assistance will be obtained from having a work like Stuckhardt's chemistry at hand for reference.

THE SOAP TEST FOR HARDNESS.

Most people are aware that hard water has a peculiar effect upon soap, making it curdle instead of lather when used for washing purposes. This peculiarity was made use of some years ago by Dr. Clark, of Aberdeen, Scotland, in devising a test for the hardness of water, in which the quantity of a standard soap solution needed to produce a permanent lather on water, indicated the degree of hardness of the water. A modification of the Clark process can be used very conveniently by master mechanics in making superficial tests of the hardness of water, and the plan has the advantage of being easily applied. With a test tube and a small bottle of soap solution the investigator is ready at any time or place to make tests, and a few minutes spent over each specimen will give him an idea of the value of the water for boiler purposes.

The original Clark soap test was made with a soap solution of known strength of which a certain measured quantity was required to produce a permanent lather on a gallon of water containing a given quantity of carbonate of lime. The degrees of hardness of other specimens were computed according to the quantity of the soap solution required to produce a permanent lather. Preparing soap solution of a certain strength, and water of a certain hardness for the purpose of indicating a point for beginning the computations is a tedious operation, and the soap test can be used in a much simpler way. While making numerous tests of water on the Burlington, Cedar Rapids & Northern Railway some years ago, to ascertain the condition of water tanks at different seasons of the year, and in examining the supply of proposed water stations on extensions of the road, I used the following modification of the Clark process:

MODIFICATION OF THE CLARK SOAP TEST.

The Cedar river during its normal flow in summer, contains about ten grains of solid matter, mostly calcium carbonate, to the American gallon of 58,373 grains. This I considered good boiler water and made it the standard of comparison for my tests. Beside the shop there is a well which the people who built the road dug for supplying boiler water, although the Cedar ran a few rods distant. This well water contained about 40 grains of solid matter to the gallon, one-fourth of the impurity being sulphate of lime. This water I made my "awful example" standard of comparison, so that water approaching this in hardness was condemned.

The soap solution I made by dissolving seventy grains of castile soap, or white soap powder, in a pint of alcohol. Care must be taken that all the soap is dissolved, and then it is best to keep the mixture in an even temperature not below 60° Fah. The tests can be made more accurately by having the water under examination brought to the same temperature as the soap solution.

APPLYING THE SOAP TEST.

In making the tests, a measured quantity of the Cedar water was put into a stoppered

bottle. One ounce of water put into a two ounce bottle is a convenient quantity. The soap solution was then measured out with a pipette made to hold 30 drops, and the bottle was well shaken after each measure till it was found that a lather was formed which held on for five minutes. The operation was then repeated, and the last charge from the pipette was put in, drop by drop, till the point where a permanent lather formed was noted. A similar performance was gone through with the bad well water and very little practice enabled the operator to ascertain where a specimen of water, stood between the range of the good and bad water.

The soap solution must be kept in a properly stoppered bottle, and every time a new solution is made its strength must be tested in the above fashion. The solution deteriorates when kept longer than a month or six weeks.

The degree of turbidity caused by the first charge of soap solution, is an indication to the practiced experimenter of the degree of hardness of the water.

Most men interested in ascertaining the condition of boiler water can devise means for obtaining water, of known hardness wherewith to make comparative tests.

If water under examination prove very hard, the test will be more accurately done by diluting it with its own volume of distilled water.

The soap test is good for lime in all its forms, and magnesia, but the latter impurity uses up more soap than lime does. So where magnesia abounds in water, the specimen under trial will seem harder than it actually is. Magnesia is also slower than lime in acting upon the soap. Water that contains magnesia will produce a lather when enough solution is put in to overcome the lime present, but if it be allowed to stand a few minutes till the magnesia acts, the lather will not then form. The presence of certain alkaline salts in water such as the carbonates and sulphates of soda and potash injuriously affect the soap test by making the water appear softer than it is, since they accelerate the forming of a permanent lather. Keeping these facts in mind will often prove of valuable service in making tests of water.

When the soap test indicates that water contains hardening ingredients, representing more than 15 grains to the gallon, other tests should be at once made to ascertain what the leading ingredients are.

DIFFICULTIES OF PURIFYING WATER FOR LOCOMOTIVES.

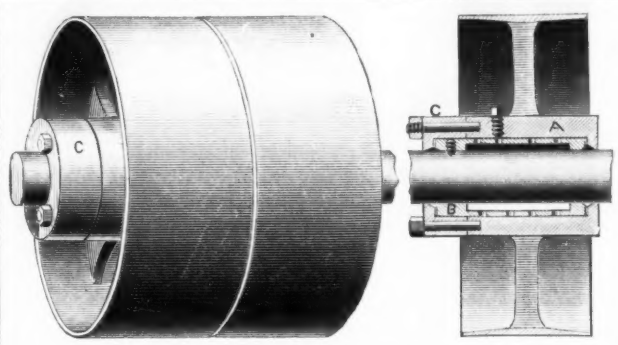
The nostrums offered to railroad managers for purifying feed water are legion, but it is doubtful if a single remedy has proved entirely successful. In most instances the material or means used have been worthless or impracticable, but in other cases the appliances have not received justice from those attending their application. Most people underrate the magnitude of the task involved in undertaking to render the impurities of feed water innocent in locomotive boilers. The case of a learned professor who undertook to doctor the feed water for locomotives on a prominent road, where he made his arrangements for each engine using one thousand gallons of water a day, is representative. When provision has to be made for some engines using double that quantity each hour. the difficulty of the transaction becomes apparent. As has already been said, I believe that obtaining soft surface water is the proper way to avoid trouble with locomotive boilers, but where this is impracticable, considerable saving can be effected by "doctoring" the water if the operations are intelligently conducted.

MUD.

Mud is the most universal impurity of feed water, and in many cases it causes the destruction or injury of sheets, particularly the crown sheet of fire boxes. Where the water of a road is habitually muddy it would pay to filter the water or to have two tanks at each water station so that a system could be followed of letting the water settle in one tank while the other was in use. The settled mud, by this means, could be washed out regularly before a tank were re-filled.

CARBONATE OF LIME.

Dr. Clark, inventor of the soap test, recommended a method of purifying water containing carbonate of lime, which has been successfully followed in many places, especially in England. It consists of adding caustic lime to water containing carbonate of lime. By this process 28 grains of caustic lime result in the precipitation of 100 grains of lime carbonate. Or, to put it in a practical shape, where a tank contains 30,000 gallons of water, each gallon being impregnated with 30 grains of lime carbonate, 36 pounds of caustic lime will be sufficient to precipitate the whole of the impurity, making a total deposit of 164 pounds.



IMPROVED LOOSE PULLEY.

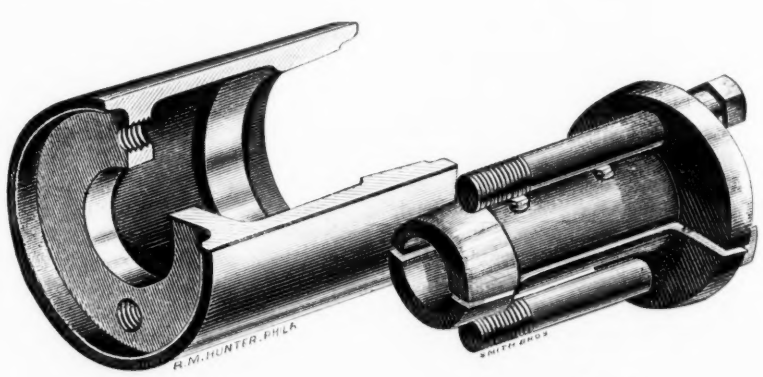


FIG. 1. FIG. 2.

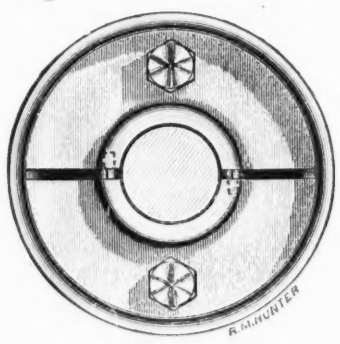
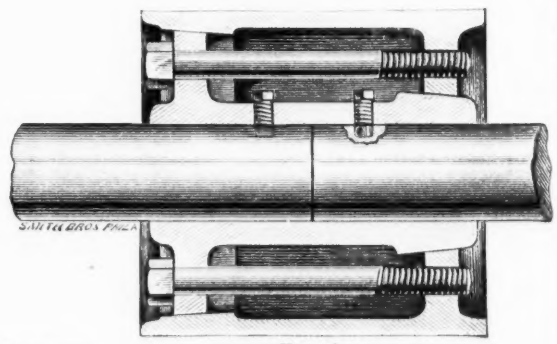


FIG. 3.



COUPLING. FIG. 4.

SULPHATE OF LIME.

Where the water impurity is principally sulphate of lime, the caustic lime remedy will not work, but a precipitate of the objectionable compound can be made by treating the water with caustic baryta or caustic soda. In the first case the baryta takes possession of the sulphuric acid holding the lime in solution, allowing the latter to fall down as mud; when the soda cure is applied the sulphuric acid deserts the lime and combines with the soda, for which it has greater affinity leaving the lime to precipitate, unless it be preserved in solution by the carbonic acid that accompanied the soda.

Where the water contains a mixture of lime sulphate and carbonate, the soda treatment may be advantageously used in combination with the caustic lime system.

Attempts have frequently been made to purify water by putting chemicals into the locomotive tenders, the impurity being precipitated in the boiler. The leading objection to this system is, that it leads to enormous quantities of sediment being deposited inside the boiler, since in some instances the purifying substance is as bulky as the original impurity. In other cases the chemical introduced into the boiler causes foaming. Let us take the case of water that contains 15 grains of sulphate of lime to the gallon and is treated with sulphate of baryta. To do so properly one grain of the chemical will be required for each grain of lime. A freight engine uses 75 gallons of water to the mile, and runs 100 miles a day. This is light service, both for water and mileage; yet within ten days, over 3,000 pounds of solid matter is injected into the boiler. To purify water by injecting chemicals into locomotive boilers, and prevent the boiler filling up rapidly with mud, or giving trouble from foaming, the blow-off cock and surface cock must be used so frequently as to be felt on the consumption of coal. Where purifying of feed water *must* be done, the right place to carry on the process is in the station tanks or in special appliances beside them. By carefully watching the character of the impurities in the water, and treating them with their proper precipitants, labor and expense devoted to the purification of feed water may bring in good returns; where attempts are made to improve the water over a whole road by one method of treatment, failure is certain.

Philadelphia Standard Coupling.

On this page we publish four cuts, showing different views of the above-mentioned coupling. The invention consists of a cylindrical shell having two conical faces, both pointing in the same direction, but not coincident with each other, in combination with clamping jaws having conical faces arranged to work upon those of the shell. Fig. 1 shows the shell, and Fig. 2 the clamping jaws that fit into it encircling the shaft.

When the clamping jaws are slipped into the shell, they are drawn tight by the bolts shown, which transmit the strain equally along the entire pair of jaws and in a line with their movement. The arrangement of the coupling can be well understood by an examination of Fig. 4, which shows it in cross-section. The coupling has the merit of compactness combined with strength and power. It is being placed upon the market by the Standard Coupling Company, R. W. Rexford, manager, 17 North 6th Street, Philadelphia, Pa.

Improved Loose Pulley.

An improved construction of loose pulleys is illustrated in the annexed perspective and cross-section cut. The design of the hub and bushing is such that instead of forcing the oil from the wearing faces by the centrifugal action of the pulley, it is driven to the wearing faces, insuring perfect lubrication and consequently greater durability. The bushing is hollowed out inside, and perforated to contain the largest amount of oil possible, the perforations serving as ducts to supply oil to the wearing faces on the outer face of the bushing. *C* is a cup flange overhanging the end of the bushing to give access to the tap screw which secures bushing to shaft and to the complete enclosure of the bushing. The bottoming screw plug is removed to charge the pulley with oil. It is claimed that this arrangement keeps out all dirt from the working part, and that repairs can be easily effected. The pulley is being placed on the market by Martin L. Senderling, Jersey City, N. J.

Western Marine Grievance.

A correspondent of the Cincinnati *Marine Journal* calls on Inspector-General Dumont to remedy a growing evil in the western marine service. The evil is this: An engineer or pilot applies for a license, say in Chicago, and is refused. He then goes to Milwaukee, or any other port, and applies, and is granted it. Or an old steamboat, with rotten boilers, will leave the port where she is owned, and go to some other port, where the inspector is a friend of the owner, and the boat is granted a license, when, if she had been inspected at her home port, she would have been condemned. This is not an imaginary state of things, but veritable history. A case occurred a few days ago. An engineer, who applied for the raising of the grade of his license in Cleveland, and was refused, went to Buffalo, and the inspector of that district raised the grade of his certificate. Now, the inspector in Cleveland was wrong in not granting the raise, or the inspector in Buffalo was wrong in raising the grade without first finding out the reason of the refusal of the inspector in Cleveland. To obviate this sort of work, the applicant should be made to show to the inspector where he applies for a license, or for a raise of the license, that he had not so applied to any other inspector, or the inspector that granted the license ought to be the one to raise the grade of the license before the expiration of the same, as, in the case referred to, the first license had been only granted three months when the holder of the same applied for a higher grade, and was refused, for the reason that it was proper only to ask for a raise after the holder had served one year as assistant engineer.

The *Fort Worth Gazette* recently changed hands, and this is what a reporter from one of its contemporaries drew out of the new proprietor:

"The paper would be run on business principles. The strongest side would be watched for, and where the greatest revenue would come from, the paper would go that way. He says Peter Smith has received $5,000 worth of free advertising, and while he has done much for the city, others are entitled to some credit. Hereafter the paper will puff for pay. If a paper published seven days a week will not pay, only six issues will be printed. If a seven-column paper is too large, it will be reduced to six columns."

Evidently independent journalism is not expected to pay in that part of Texas. If Peter Smith gets any prominent notice in that paper hereafter, the readers may be assured that he has paid cash for it.

Our esteemed contemporary, the *Revue Industrielle*, of Paris, which keeps its readers well posted on mechanical progress, devotes over a page of a recent issue to illustrating and describing the "Indicateur du Travail des Machines a Vapeur, system Crosby." A Crosby indicator was shown at a recent exposition at Rouen, and the article referred to commends the instrument to the attention of French engineers.

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NEW YORK, SEPTEMBER 27, 1884.

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Decline of Water Power and Advance of Steam Power.

An interesting and highly suggestive phenomenon in the industrial progress of this country is the relative decline in the amount of water power as compared with steam power utilized for business purposes. This tendency is all the more suggestive by reason of the fact that no other country in the world is as well endowed with natural water power as the United States. Manufacturing enterprises usually seek water power, in a new country, because of its cheapness and availability, but when all the valuable powers have been absorbed by those who are determined to get a steady revenue from them, neither of these two features of original desirability stand forth with much allurement. As water powers are improved they become more costly to the users; as steam power is improved it becomes less costly to the users.

In 1870 the census showed that there were more water wheels in use than steam engines, and that their horse-power was almost as much as the total horse-power of the engines. The census of 1880 showed more steam engines than water wheels, and a total power far in excess of the latter. The change is best shown in tabulated form, thus:

	Water Wheels.	Horse Power.	Engines.	Horse Power.	Total.
1880	55,404	1,225,379	56,483	2,185,458	3,410,837
1870	51,018	1,130,431	40,191	1,215,711	2,346,142
Pr. ct. of inc.	8.60	8.40	40.54	7	45 38

During the four years since the census was taken the progress of steam power has been greater than in any other four years of our history. What a census would now show as the relative decline of water power to be, or what the next census will show it to be, can be imagined after a study of the above figures.

The reasons for the great advance of steam power are not difficult to discover. Water power is not as reliable as it was before the forests were thinned out or cleared away, while, owing to improvements in engines and boilers, steam power is more reliable. Severe droughts and heavy floods have both operated to set at naught the business calculations of those dependent upon water power, while winter freezes and floating débris contribute to the annoyance and damage. The cost of dams is sometimes considerable. It is proposed to build a new one at Holyoke, to cost a million dollars, or a million and a half. The expense of land overflowed is often a large item in the cost of water power. As land becomes more valuable the cost of water power must increase. The application of power in industrial operations increases in a greater rate than the number of hands employed as shown by census returns, and the demand for steam engines and boilers is one that must inevitably keep pace with the development of the industrial resources of the country. It is a demand that has assumed elements of permanency.

Metallic Car Frames.

Considering the rapid displacement of wood by iron and steel in so many lines of constructive work, it seems curious to observe how little progress our car builders make towards adopting the material that possesses so many natural recommendations for car work. There is no reason why the whole of car trucks and frames should not now be built of iron and steel, except that the conservative sentiments of master car builders are opposed to a radical change. When locomotive builders began to make tender frames of iron and steel, the conservative car builders perceived numerous serious objections to the change, but metallic tender frames crept into favor till now wood for that purpose is a thing of the past. The change from wood to iron for tender frames was not made without many discoveries as to the best form of details, the kind of bar best adapted to the work, the style of fastening that produced most satisfactory results in service, the degree of rigidity appropriate for wear, how to fasten the attachments in the manner best calculated to withstand the strains and shocks of operating, and many other facts of value in construction. The lessons learned by this volume of experience might be of valuable service to any master car builders who recognize the meaning of shadows cast by coming events. When they must attend to the construction of car frames of iron, however reluctantly it may be done, the light of experience in making tender frames might guide them clear of many blunders.

We should like to know why railroad rolling stock should not be taxed the same as property belonging to manufacturing firms or corporations. If locomotives and cars are anywhere taxed, it is the exception, not the rule. The Federal District Court at Harrisburgh, Virginia, has decided adversely to the right of the State to tax the rolling stock of the Baltimore and Ohio Company, which traverses the State. If the laws don't require railroad corporations to pay their just share of taxes on all property owned by them, other laws should be enacted promptly that will meet the case. But there is one great difficulty in the way. Legislators are accustomed to travel everywhere on free passes given them by the very companies that are escaping their just proportion of public taxes; and the daily newspapers—those "guardians of the people's rights"—raise no protest, because they are also well supplied with free passes (to say nothing of further favors) by the same companies.

A Michigan man writes us asking for "the address of Wanderbilt and George Gold." We don't know the parties. They are not on our subscription list.

Driving the Last Spike of a New Railroad.

A new railroad trunk line has just been completed, called the Louisville, New Orleans & Texas railroad which connects New Orleans and Memphis. The ceremonies of driving the last spike were performed in a fashion which indicated that southern railroad managers know how to make innovations on the northern methods which culminated in the Willard way of opening the Northern Pacific Railroad. On the southern road, speeches, bottles, Fourth of July demonstrations, silver spike and bank president were all conspicuous by their absence. The last spike was iron, and the trackman drove it home with his common maul, the gang of construction men cheered, took a drink of ice water all round, mounted the construction train, and were pulled to a siding to make room for passenger and freight trains to pass. These ceremonies were performed without enormous expenditure of money, and the railroad manager expects to operate the road without the aid of a receiver.

Metal Railroad Ties.

There is a good deal of talk now heard in railroad circles in this country about metallic ties for track, but very little has yet been done in the way of trying iron or steel ties. Several roads have got a few miles of track laid with metallic ties as an experiment, but the value of the new material, compared with wood, cannot be calculated from experience. Meanwhile the mileage of railroads increases, and good wooden ties become scarcer every month, so that the period is not very remote when the expense of timber will compel railroad companies to adopt metallic ties in some form. Few issues of the Patent Office Record appear now without having particulars of the invention of metallic ties, so that inventors are preparing to provide a suitable form of tie when the expected demand arises. On some railways in Europe, metal sleepers have been in service for years, and a considerable mileage of Indian railways has been constructed with iron ties. M. Vautherin, a French inventor, designed an iron tie some ten years ago which has been used considerably on German railways. This tie is made in the form of an inverted trough, and successfully retains hold of the ballast, an important performance which many metal ties have failed in. A contract has lately been made to supply 200,000 iron ties of this kind for use in the Baden railway system. Soft steel, which in Germany can be produced cheaper than good iron, is found very suitable for making ties. The first cost is slightly higher than wooden ties, but the greater durability of the metal makes it cheaper in the end.

Steam Engine Practice in the United States.

Steam engine practice in many respects is so different in the United States from what it is among other commercial or industrial nations, that it was extremely desirable, that a clear and succinct account of its salient features should be made known to the scientists who attended the meeting of the British Association at Montreal, and many of whom are now visiting different parts of the United States. This duty to the American nation was admirably performed by J. C. Hoadley of Boston, in a paper which he read bearing the title at the head of this article. The tendency of American steam engine practice is clearly indicated in Mr. Hoadley's preliminary remarks that: "Following the usual course of development which rules in all untrammeled, healthful industries, no less than in the works of nature, the steam engine is daily becoming more and more differentiated, the better to adapt each special form to some particular purpose. As the machinists' tools used in its construction are specialized and adapted each to a single class of operations—their increased efficiency for a special purpose more than compensating for the limited range of their utility—so the steam engine itself broadly considered is continually developing new and useful varieties. At the same time, and as a consequence of the earnest study devoted to each variety, a parallel tendency to fixedness of type in each class is no less apparent than in the diversity of types."

After this brief introduction Mr. Hoadley proceeded to classify and describe the special forms that leading types of American engines had taken. This country is so far in advance of its industrial rivals in making pumping engines of novel form and high efficiency, that he naturally opened his paper with descriptions of the principal engines of this kind in use. Constructive outlines of our most noted pumping engines were given and the recorded tests of their performance were also detailed. Some of the performances have obtained world-wide celebrity, but others published in this paper are scarcely less noteworthy than the duty of, for instance, the Pawtucket pumping engine. No one could listen to this portion of the paper with intelligent attention, without admitting that the United States have good reason to be proud of the mechanical engineers who perfected the engines described and adapted them so admirably for the service they are required to perform.

"Steam engines of medium size and moderately high speed" opens the consideration of the good class of engines manufactured in advance of orders for the trade, and used for a variety of purposes. In this connection Mr. George H. Corliss receives credit for the elevating influence he has exercised upon this form of engine; and an engine of his make used to drive a cotton mill receives the first description supplemented by particulars of tests. Descriptions of other well known engines follow, and sufficient attention is devoted to this portion of the subject to convey a clear idea of what kind of engines are supplying motive power to our manufacturing and mining establishments. Adverting to the Hoadley portable engine which, in this country, is the pioneer of the large class of engines with automatic cut-off, controlled by centrifugal governor placed on the crank shaft, Mr. Hoadley gives the genesis of this device. Attempts to control engine speed in this manner were first made in England about the beginning of this century, but the means employed were

very imperfect. The idea was worked on by numerous inventors in Britain and in this country at different times up to 1873, when Mr. Hoadley entered the field as a patentee, his invention receiving an important improvement in 1875, which secured the success of the device.

A characteristic part of the paper says: "Marine engines must get but cursory notice here. This is the less to be apologized for, inasmuch as 'Maw's Recent Practice in Engineering' is not entirely silent on the subject of recent American marine engines. If no more successful than the writer in obtaining information from American marine engine builders, the scant notice will match the scant courtesy." This experience with our marine engine builders is by no means novel. In all other departments of mechanical engineering, American manufacturers are noted for their liberality in furnishing information about their operations, but a small clique of marine engine builders seem to vie with each other in treating with discourtesy parties who try to learn something about the engines in course of construction. Those who have nothing to show, and whose methods of doing work are disgracefully crude, generally make the greatest mystery of their operations.

Considerable attention is bestowed upon the American locomotive, and the peculiarities and performances of several of our best types are described. The durability of this kind of American engine is strikingly illustrated by recorded mileage taken from railroad companie's books. Limited space at present prevents us from saying more about this interesting paper, but we will publish more of it in future issues. One of the concluding paragraphs says: "With compound locomotives little has been done in this country. A few have been constructed, but without any marked success so far as the writer has been able to learn. It is certainly very desirable to reduce the consumption of fuel in our locomotives; but if compounding involves of necessity the use of a cranked axle, as in some examples, it can never be adopted in America, since the well-known evils of that feature must far outweigh all possible gain from compound cylinders. The locomotive engine is without doubt the most important application of the non-condensing engine of Oliver Evans and the multitubular boiler of Nathan Read, and its development demonstrates that it has not been neglected in the land of its nativity."

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(367) J. R. S., Woodberry, Md., asks: What is the best composition of material for preparing blue printing paper? *A.*—This information can be found in the AMERICAN MACHINIST of September 23, 1882.

(368) C. F. P., Wausau, Wis., says: Will you answer the following question? In running a machine, for instance a lathe, head running the power at the same rate of speed in both cases, using core pulleys to obtain different rates of speed of the lathe head, will it require more power to run the lathe head four hundred revolutions per minute than to run it two hundred revolutions? *A.*—It will require more power for the fast speed.

(369) G. M., Newark, N. J., asks: How thick will a cylinder have to be that will resist safely a pressure of 2,000 pounds to the square inch? *A.*—The rule for determining the thickness of metal is: Multiply the pressure in pounds per square inch by half the inner diameter of cylinder in inches, calling the product *a*. From the safe cohesive strength in pounds per square inch of the metal of which the cylinder is made subtract the pressure in pounds per square inch. Divide the product *a* by the remainder, and the quotient will be the required thickness in inches.

(370) L. P., New York, writes: Please inform me of particulars about the system of forcing water through pipes for dwelling use without aid of a pump. *A.*—We believe the Riker positive system is what our correspondent refers to. By this arrangement a gas jet is used, which operates a vacuum and suction chamber that are used alternately to draw and expel the water by direct action.

(371) C. A. A., Toronto, Can., asks: 1. Can ¼-inch steel be made to stand a boiler pressure of 150 pounds on a pop safety valve; if not, what size should be used? *A.*—The size of steel suitable for springs of safety valves depends upon the size and form of the valve. Steel ¼ inch thick would be rather light for the spring of a high-pressure safety valve. 2. Does a spring require to be hot when coiled? *A.*—Yes. 3. What is the most universal way of tempering such springs? *A.*—They are tempered in oil, or in a specially-prepared chemical bath.

BUSINESS SPECIALS

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Curtis pressure regulator and st'm trap. Sep. 20, p.16.

Mackenzie Cupolas and Blowers, 245 Broadway, N.Y.

Presses & Dies, Ferracute Mach. Co., Bridgeton, N. J.

Steel Name Stamps, &c J. B. Roney, Lynn, Mass.

Rotary Files, Tower M. Works, E. Brookfield, Mass.

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 86 John street, N. Y.

Herbert W. T. Jenner, Mechanical Engineer and Solicitor of Patents, 632 F st., Washington, D. C.

Lyman's Gear Chart. How to lay out gear teeth. Price 50 cents. E. Lyman, C. E., New Haven, Conn.

Foot Power Machinery, for workshop use, sent on trial if desired. W.F. & John Barnes, Rockford, Ill.

The latest Improved Tack and Match Machinery is made by White Machine Co., Waterbury, Conn.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York

Consulting Engineer and Mechanical expert, C. C. Hill, 84 Market street, Chicago, Ill.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

National and box chucks, foot and power lathes, and slide rests. Lodge, Barker & Co., Cincinnati, O.

DRAWINGS — Mechanical, electrical and Patent Office. All styles of artistic designing. Special facilities. Low rates. Wallace Metcalf, 140 Nassau St., N.Y.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

Improved Tack Machinery, made by The Willets Man'f'g Co., can be seen in operation at their works, 57 Clifford St., Providence, R. I.

The "Wax Process" Engravings shown in the AMERICAN MACHINIST each week are made by Struthers, Servoss & Co., 32 Frankfort Street, N. Y.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large: prices low. Frasse & Co., 62 Chatham St., N. Y.

The Complete Practical Machinist, $2 50; the Pattern Maker's Assistant, $2.50; Mechanical Drawing Self-taught, $4 00; books for practical machinists. Address, Joshua Rose, Box 3,306, New York City.

Steam users, expecting to put in a first-class engine, from 10 to 60-horse power, will find it to their interest to send to the Straight-Line Engine Company, Syracuse, N. Y., for their new catalogue.

EXTRACTS FROM CHORDAL'S LETTERS, 400 pages, 12mo., handsomely bound in cloth. New and enlarged edition, with over 50 illustrations. Price $2. Published by John Wiley & Sons, 15 Astor place, New York.

Useful Information for Steam Users—A 100-page pamphlet, on the care and management of the steam engine and boiler, with hints and rul s for engineers and firemen. Every engineer should have this book. Send 25c. in P. O. stamps to the J. N. Mills Publishing Company, 165 Broadway, N. Y.

MANUFACTURES.

The Avery Plow Company, capital $20,000, has organized at Austin, Texas.

John F. Lynch, Philadelphia, will erect a shop 30x30 feet, on Bowman street.

R. J. & F. Monks will erect a 33x35-foot shop on West First street, Boston, Mass.

Charles C. Schildwachter, 77 E. 125th street, New York, will build a new carriage shop.

Hancock Brothers & Co., Lynchburg, Va., will erect a five-story brick factory to cost $8,000.

D. G. Allen, La Fayette, Ga., is building a steam gin, and contemplates putting up a cotton-seed oil mill.

It is reported that the Texas Pacific Railroad Company, will build large machine shops at Marshall, Texas.

James Curran, 512 West Thirty-sixth street, New York, will erect a six-story brick factory to cost $15,500.

B. F. Stephens & Brother, of Greenville, Tenn., wool manufacturers and flour millers, are to build a new mill.

Dick & Meyer, 32 North Eighth street, Brooklyn, N. Y., will erect a two-story brick shop, machine 40x50 feet, to cost $6,000.

S. S. Zeller, Philadelphia, is contractor for the erection of a 40x100-foot factory on Jefferson street, corner of Ninth street.

The Southern Machinery Company, Shelbyville, Tenn., has obtained the site for its machine shops and foundry to be built.

The Glen Cove (N. Y.) Machine Company has been organized with $50,000 capital. It is proposed to build a shop in that village.

Albert Cook, North Vassalboro, Me., is building a mill, 35x80 feet, two stories and a basement, for the manufacture of woolen goods.

Winthrop, Me., is organizing a $4,500 stock company to build an agricultural implement factory on the site of one recently burned.

The new woolen mill now building at Pittsfield, Me., will be running by November. It will employ seventy-five to one hundred hands.

The manufacturers of Holyoke, Mass., have formed an association to protect their interests as regards power to drive their works.

E. Greenfield's Son & Co., Middleton street and Harrison avenue, Brooklyn, will erect a boiler and engine house, 38x38 feet, to cost $5,000.

The Salter Brothers, boiler makers of Pottstown, Pa., have purchased six acres of ground, upon which they will erect additional works.

The town of Dexter, Me., voted at the last town meeting to exempt all manufacturing enterprises investing $3,000 from taxation for ten years.

The George H Gilbert Manufacturing Company, of Gilbertville, Mass., are preparing to enlarge their machine shop and dressing room at No. 1 mill.

C. C. Heisen, Aberdeen, Miss., is interested in a project to build a cotton mill at that place. About half of the $100,000 needed has been subscribed.

A two-story brick machine shop, 37x180, and a three-story brick warehouse, 50x204, will be erected this fall by the Silver & Deming Manufacturing Company, Salem, O.

The iron foundry to be established by Mr. Pratt, of Carver, will be located near the railroad track south of the depot at Campello, Mass. A spur track will be built to run alongside the foundry.

The Ballou Manufacturing Company, Hartford, Conn., have issued a catalogue and price-list of their precision screw-cutting lathe, and other tools. They will soon have ready a universal watchmakers' lathe.

Most of the paper mills in Holyoke were obliged to stop by reason of a leak in the dam. Trouble was experienced in stopping the leak. The paper mills were behind their orders, and the stoppage is a loss to them.

The Acme Machinery Company, Cleveland, O., are building a new 40x100-foot shop, two stories high, for the manufacture of Acme bolt-cutters and machinery. It will be ready to start work before the 15th of October.

Great suffering is caused among the mill operatives of Fall Riverby the shut down two weeks this month. They earn six dollars a week on the average when working, and quite a large proportion have families to support.

The Ottawa Iron Works, at Ferrysburg, Mich., owned by T. W. Ferry and Andrew Thompson, and appraised fifteen months ago at $98,000, were sold recently under a mortgage and bid in by the holder of it, Alexander Wheldon, for $10,0.0.—*Industrial World.*

The newest thing in railroad travel is a bay-window parlor car, built by the Pennsylvania Railroad Company, at its shops at Altoona. The next improvement should be a parlor car with a piazza on both sides.

The Beechenbrook Foundry and Machine Works is a new industrial enterprise that Jolliffe & Estill have recently put in operation near Lexington, Va., using water-power. This company will manufacture engines, boilers, castings of all kinds, machinery, etc.

The Gage Machine Works, Waterford, N. Y., write us: We have just completed extensive repairs to our water-power, and are now running with full complement of men. Have always on hand, or under way, square, arbor and turret Fox lathes, and other machinist tools.

The *Iron Trade Review* says: Negotiations by the Chapin Pneumatic Works, of Chicago, for the purchase of the Nes Silicon Steel Works, at Sandusky, O., are still in progress, with favorable indications for a sale. The company propose to manufacture round, square, and flat iron.

S. S. Hepworth & Co., Glenwood Station, Yonkers, N. Y., have begun to build machine tools of new design. They will shortly have ready a new column-facing machine, for turning up a three-foot square column. They will also have ready a 24" swing engine lathe of extra heavy pattern.

The Union Foundry and Machine Company, of Catasauqua, Pa., has nearly finished its new foundry, which is 60 by 100 feet. Work is expected to begin next week. The business of this concern has become so extensive that this improvement was a necessity.—*Mining Herald and Colliery Engineer.*

L. B. Eaton, 22 Cortlandt street, New York, has been appointed general agent for the sale of Zell & Burton's water-tube boilers. The firm has increased its facilities for manufacture, and the introduction of the boiler has been quite successful. Mr. Eaton will establish agencies in the principal business centers of the country.

F. Cowperthwaite will erect a stone factory on Calyer street, near Kent street, Greenpoint (Brooklyn, N. Y.), to cost $25,000. It will be 126x50 feet.

The Galvin Brass and Iron Works, of Detroit, Mich., have been incorporated with a capital stock of $100,000, to manufacture all kinds of brass and iron ware. The incorporators are Francis Palms, M. W. O'Brien, H. W. Skinner, F. F. Palms, Thad. deus Galvin, John Galvin, John W. Strackbein, John Collins, W. S. Armitage, and I. T. Keena.

The Curtis Regulator Company, of Boston, has recently supplied the Davidson Steam Pump Company with one of their 12" steam pressure regulators, to be used for the purpose of taking steam from a battery of boilers at 65 lbs. pressure, and delivering it automatically to the pumps at 25 lbs. pressure, thus running two sets of pumps at different pressures from one set of boilers.

The Walter A. Wood Mowing Machine Company, of Hoosick Falls, N. Y., have purchased several building lots in Lansingburg, on the Hudson river, and will either move their entire works to that village or establish branch works there. The high cost of freight from Hoosick Falls is said to be the cause of the movement. It costs the company, on the average, about $3,000 a week for freight, and it is estimated that half that amount can be saved.

Norton Bros., of Chicago, have recently shipped to Sherwin, Williams & Co., of Cleveland, O., paint manufacturers, a large plant of machinery for making their paint cans. This machinery is to replace that destroyed in their fire last May; included in this machinery are two automatic double seaming machines, for making cans, recently illustrated in this paper. One Norton automatic soldering machine, and several automatic seamers for closing filled cans; also, presses dies, and special tools. Norton Bros. are very busy, doubling their own plant of automatic machinery, with prospects good for all they can do.

The Egan Company, of Cincinnati, O., report business very fair with them, taking into account the general depression, and say they have no complaints whatever to make. They are having a great many inquiries for their improved wood-working machinery, and among recent sales report complete outfit for a planing mill at Chattanooga, Tenn.; a furniture factory at Rome, Ga.; a coffin factory at Batesville, Ind.; a bracket factory at Spades, Ind.; besides a large number of single machines for various other parts of the country. They are having a fine run of trade on their new automatic knife-grinding machine and their self-feeding rip saw. They have also just completed a new rapid-feeding flooring machine which turns out flooring in either hard or soft wood at the rate of one hundred lineal feet per minute, dressed on all four sides, and either plain or beaded, as may be desired.

Rowley & Hermance, manufacturers of wood-working machinery, Williamsport, Pa., have just completed their new foundry, which is one of the best in that city. It is fitted up with all the modern improvements. The foundry is 136x40 feet, and is lighted by sixteen windows on the ground floor. It is sixteen feet from the floor to the first row of cross beams. It has sixty-eight windows, which furnish an abundance of light, and this is one of the most important features about a foundry. The 4-ton crane is of the Yale & Towne Manufacturing Company's make. It is situated at one end of the foundry and the cupola at the other end. For carrying the molten iron from the cupola to the crane, which is one hundred feet distant, is an overhead tramway and ladle carriage, which was designed and put up by their superintendent, Mr. Young. The castings are delivered to the cleaning-room and pickle-bed by means of a car attached to the tramway. The heavy castings made under the crane can be delivered by the crane right upon the pickle-bed. There is also a railway running from the cleaning-room into the machine shop, that delivers the castings all ready for the machine work.

Manning, Maxwell & Moore, 111 and 113 Liberty Street, New York have got out the finest catalogue of their goods that we have ever seen. It is a handsome quarto volume, of 690 pages, profusely illustrated with excellent wood engravings, showing varied details of the railway and machinist tools handled by the company. In some respects, the catalogue resembles a mechanical cyclopedia. It contains such full information regarding certain lines of tools and machinery that it will be a useful work of reference for parties wanting information on the subjects. For instance, 22 pages are devoted to the illustration of grinding apparatus, which takes in a variety, embracing the big, stand-by grindstone and the tiny jeweler's polishing lathe. Within this range there are several grinding tools that many machinists have never seen. Injectors, pumps and other water-forcing apparatus have 52 pages devoted to their description, and few men can go carefully over the list without learning many new facts about hydraulic apparatus. In looking over the large space filled with particulars regarding shop tools, we observed standard productions of nearly all our best-known machine-makers. Any customer looking for a tool will have here a wide field to choose from. Even chucks get 13 pages of illustrated matter, arranged to set off to the best advantage the merits of each make. To enumerate the kinds of tools and appliances described in this catalogue would be beyond the range of our columns. We have devoted considerable time to the examination of the book, and found it a pleasant labor, the admirable wood cuts being well worthy of detailed inspection for their artistic merits alone.

Kingsland, Jackson & Co., Chicago, have shipped a railroad shop outfit, complete, including engine, boiler, shafting, hangers, pulleys, and tools, to Marshall, Mich.

The plow and cultivator manufacturers of the Northwest held a meeting in Chicago, September 1, organized an association and discussed the formation of a pool.

The Kansas City, Fort Scott, and Gulf Railroad Company has decided to build machine shops at Springfield, Mo. A bonus of $30,000 has been subscribed by the people of that place. The company intends to build one hundred and fifty-one miles of new road.

Machinists' Supplies and Iron.

NEW YORK, September 11, 1884.

The unusually hot weather experienced here during the last week appears to have exercised a depressing effect on business generally. In the supply trade there has been little doing, and the expected revival of activity to meet the fall trade has been postponed.

Iron—The American pig market has been practically without change, the demand still continuing slow and unsatisfactory. The efforts to combine for the restriction of production have proved futile and the plan has been abandoned. A peculiar feature about this movement was the small share of support it received in the trade, away from those who were likely to be the immediate gainers. No. 1 X Foundry is quoted at $19.50 to $20 for standard brands: No. 2 X $18 to $19 at tidewater: Grey Forge $16 to $17.

Scotch pig—This market keeps drifting along in a quite unsatisfactory way. We quote Shotts $21.50 to $21.75, to arrive; Coltness $21.50, to arrive and $22 from yard; Glengarnock $20.50 to arrive; Summerlee $20.50; Eglinton $19.50; Dalmellington $19 50.

Antimony—There has been no quotable change in the value of Regulus. The demand continues moderate and the market about steady. We quote Hallett's brand 10c. to 10¼c, and Cookson's 10½c

Copper—The market has ruled dull and almost wholly nominal during the past three days, as is usually the case immediately after a pool sale has been completed. Not over 13c. is asked for Lake, and it is intimated that bids of 12⅞c. would be readily accepted, but so far as we could learn no sales have transpired.

Lead—The value of common pig has been without quotable change, the market still presenting a tame appearance with an absence of demand as well as of important transactions. Sellers ask 3.65c. for common pig, but purchases could be made at 3.52½.

Tin—The market for pig has ruled quiet and about steady. We quote for jobbing lots Banca 20½c.; Straits and Malacca 18 30 to 18.30c.

✻WANTED✻

"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

First class mechanical engineer and draughtsman, with long experience in machine designing, is open to change. Address M. E., AM MACHINIST.

First-class mechanical engineer and draughtsman, with extensive experience as designer, superintendent, and salesman, is open to an engagement. Steam engineering a specialty. Best of references. Address "M. 100," AM. MACHINIST.

Wanted—By a thorough practical mechanical engineer, charge of machine works. Salary $2,500 per annum. 23 years' experience in firstclass works, in designing and building steam engines, shop tools, hydraulic machinery, printing presses, with extensive practice in special and general work. Good executive ability and business habits. Unexceptionable references. Address "Volens et Potens," AM. MACH.

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CIVIL AND MECHANICAL ENGINEER
and Expert in Patent Causes,
28 STATE STREET, ROOM 28, BOSTON, MASS.

BEVEL GEARS,
Cut Theoretically Correct.
For particulars and estimates apply to
BREHMER BROS.,
Machinists,
440 N. 12th St., Philadelphia, Pa.

Watson & Stillman,
468 Grand St., New York,
MANUFACTURERS OF
Hydraulic Jacks & Punches
[Improved 1884.]
Hydraulic Presses, Pumps and Fittings.
Lever and Screw Punches and Shears.
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Branch Office and Storehouse,
800 N. 2nd ST., ST. LOUIS, MO.
ENGINES and BOILERS,
MACHINE
TOOLS & SUPPLIES.
Send for Special Catalogues.
Correspondence Solicited.

BRADLEY'S HEATING FORGES.

FOR HARD COAL OR COKE.
INDISPENSABLE IN ALL SHOPS to keep **Bradley's Cushioned Hammers** and men fully employed, and reduce cost of production.
BRADLEY & CO., Syracuse, N. Y.
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FOR SALE.
Two No. 2 Power Milling Machines.
One No. 1 Gang Drill, 4 spindle, 2 spindles geared.
All Pratt & Whitney make, and just as good as new, been used three months steady.
The Razor Blade Shears Mfg. Co.,
CHILLICOTHE, OHIO.

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SIMPSON'S
PAT. GEAR MOULDING MACHINE
Sole Manufacturers and Inventors,
NORTH STAR IRON WORKS CO.,
MINNEAPOLIS, MINN.

The most **perfect**, most **simple** and most **effective** machine in existence.
NO SUPERIOR for **efficiency, accuracy** and **simplicity.**
Send for circular and prices.
NORTH STAR IRON WORKS CO.,
MINNEAPOLIS, MINN.

FOR SALE.
HORIZONTAL ENGINE, 14x36 Box Bed. Band wheel 6' diameter and 16" face. Large fly wheel, weight about 9,000 lbs., entire weight of engine about 14,000 lbs.
Can now be seen running and in good order. Delivery within a month if required.
Address, **BOX 13. STATION B.**
Jersey City, N. J.

GREAT BARGAIN.
New Pulleys at unprecedentedly low prices. Write for particulars to
THE JNO. T. NOYE MFG. CO.,
Buffalo, N. Y.

TABLES OF SPEEDS.
Tables of the principal speeds occurring in mechanical engineering, expressed in mètres in a second. By P. Keerayeff. Translated by Sergius Kern. Price, 20 cents. Descriptive catalogue of books, 100 pages, free.
E. & F. N. SPON, 35 Murray Street, N. Y.

PORTABLE FORGES.
Send for Catalogue to
EMPIRE PORTABLE FORGE CO.,
COHOES, N. Y.

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New and Complete Illustrated Catalogue,
OF BLAKE'S — IMPROVED — STEAM
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SEND FOR A COPY.
Address, GEO. F. BLAKE MANUFACTURING COMPANY.
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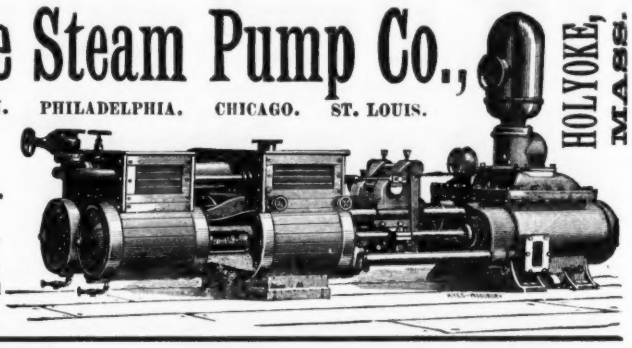
The Deane Steam Pump Co., HOLYOKE, MASS.
NEW YORK. BOSTON. PHILADELPHIA. CHICAGO. ST. LOUIS.
MANUFACTURE
PUMPING MACHINERY
FOR ALL DUTIES.
Send for New Illustrated Catalogue.



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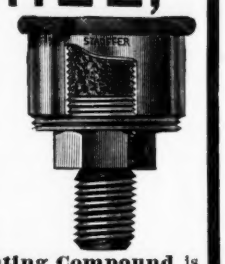
JAS. HUNTER & SON, North Adams, Mass.

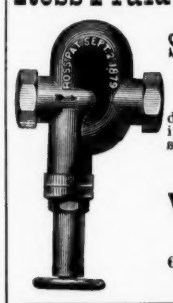
A. EDW. BARTHEL,
ENGINEER,
111 LIBERTY STREET, NEW YORK. P. O. BOX 2837.
SOLE MANUFACTURER OF THE
REISERT, STAUFFER AND BARTHEL
Lubricators and Solidified Oil.

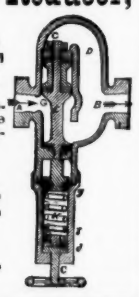


The most economical, perfect, practical, simplest, cheapest, and elegantly finished Lubricators ever put on the market. One million sold within a couple of years. The **Barthel Solidified Oil or Lubricating Compound** is used with the **Lubricators** exclusively. Whoever has once tried this Lubricant will never again use oil or any other Lubricating compounds. Send for Illustrated Catalogue.

STANDARD TOOL CO., Cleveland, Ohio. { W. A. BABCOCK. Manager.

Ross Fluid Pressure Reducer,
FOR
Steam, Water, Air and Gas.
Automatically reduces the pressure in pipes to any desired extent.





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Greenfield Vertical Engines,
2½ to 30 Horse Power.
Unequaled in workmanship and quality of material. Prices lower than any other first-class engine.
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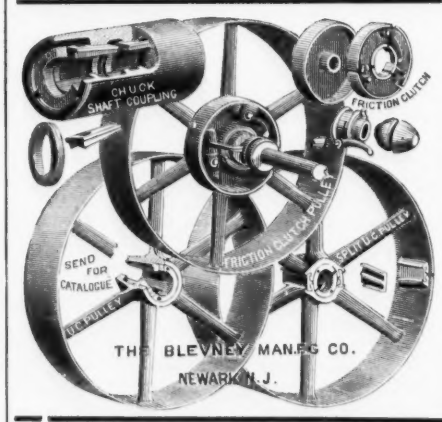
For Machinists, Railways, Mills, Mines, &c.
Please send for circular and state that you saw the advertisement in this paper.



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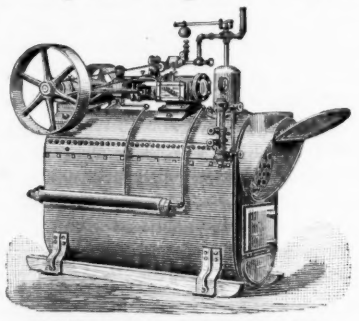

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Automatic
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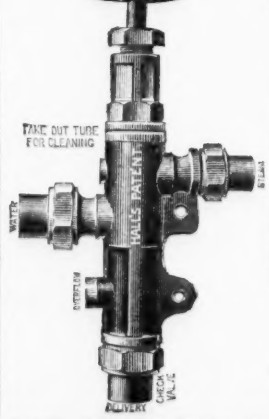

For supplying all classes of steam boilers with water.
We guarantee these Injectors to be the best, simplest and only thoroughly reliable Boiler Feeders in the world, working from 2 lbs. to 200 lbs. steam pressure.

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FOR SALE.
SECOND-HAND PLANING MACHINE,
To plane 50 inches wide, 46 inches high, and 28 ft. long; arranged to widen out to 70 inches. Ready for delivery Sept. 1st, and until that time can be seen running in our works. This machine is in good order, and will be sold at a bargain. Apply to
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"Nicholson File Co's" Files and Rasps, "Double Ender" Saw Files, "Slim" Saw Files, "Racer" Horse Rasps, Handled Rifflers, Machinists' Scrapers, File Brushes, File Cards, Surface File Holders, Vise File Holders, Stub Files and Holders, Improved Butchers' Steels.

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TESTIMONIAL ON THE MERITS OF THE

PATENT NICKEL-SEATED "POP" SAFETY VALVE.

PITTSBURGH, April 10th, 1882.

C. A. MOORE, ESQ.,
PREST. CONSOLIDATED SAFETY VALVE CO.,
111 Liberty Street, NEW YORK.

DEAR SIR:—In reply to your favor of the 7th inst., we would state that in October, 1874, we placed upon our boilers your 3-inch Nickel Seated Pop Safety Valves, which have always done their work satisfactorily, relieving the boilers instantaneously when the steam pressure reached the blowing off point, viz., 80 lbs. We have also furnished your valves to a number of our customers who have been well pleased therewith. The best evidence of which is the fact that after once using your valve they adopted them for their subsequent requirements. Yours truly,

ATWOOD & McCAFFREY.

YOUNGSTOWN, O., April 14th, 1884.

C. A. MOORE, Esq., PREST. CONSOLIDATED SAFETY VALVE CO.,
111 Liberty Street, NEW YORK.

DEAR SIR:—Replying to your letter of the 7th inst. It is now about twelve years since we commenced to use and recommend to others, "Nickel Seated Pop Safety Valve." From practical experience we have no hesitation in saying that it is the only Safety Valve in use, which can under all circumstances be relied upon. Yours truly, WILLIAM TOD & CO.

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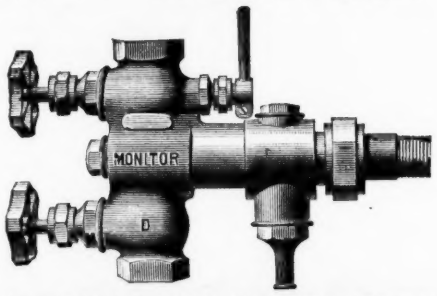

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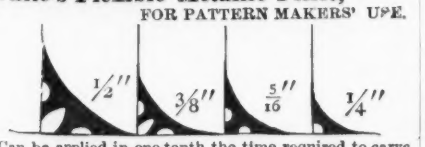

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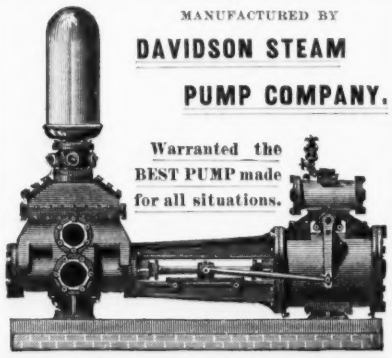

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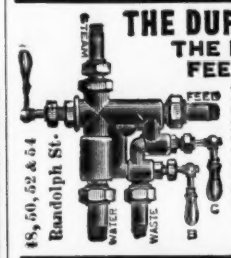

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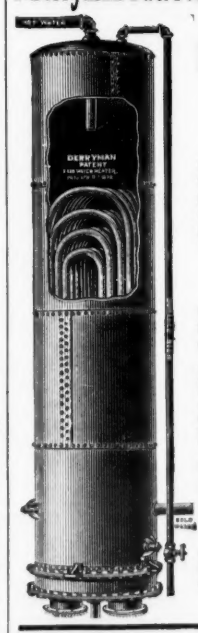

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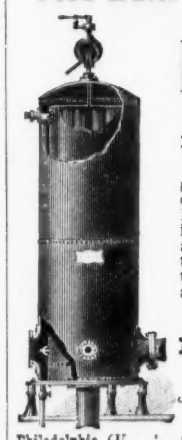

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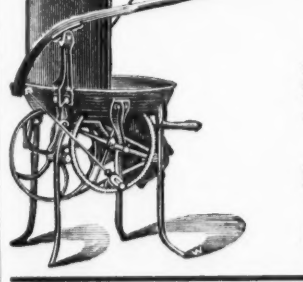

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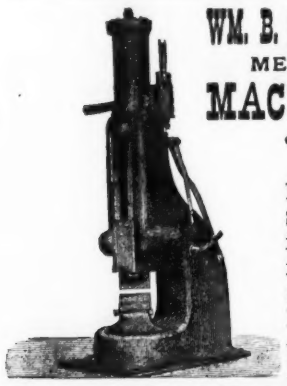

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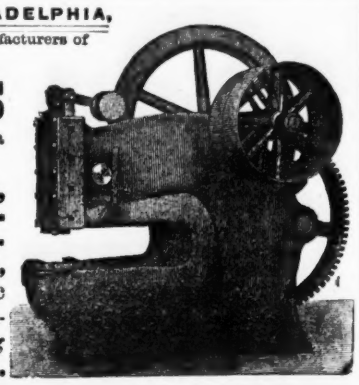

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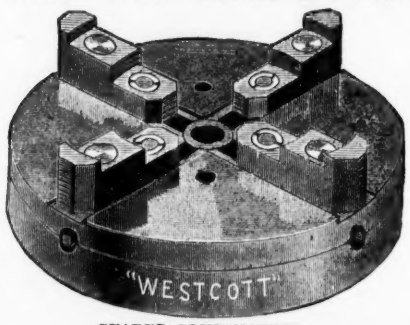

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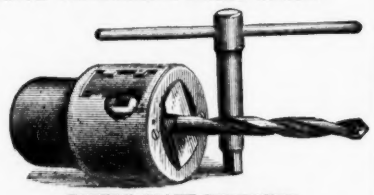

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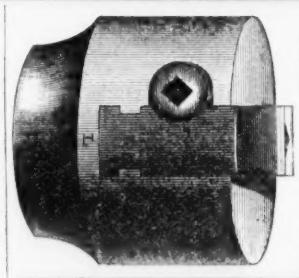

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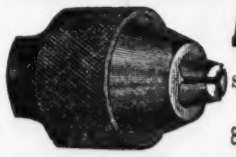

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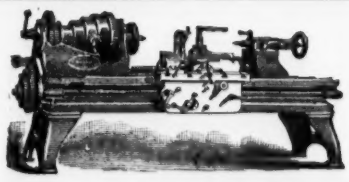

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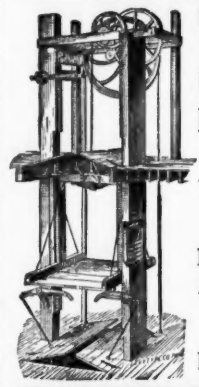

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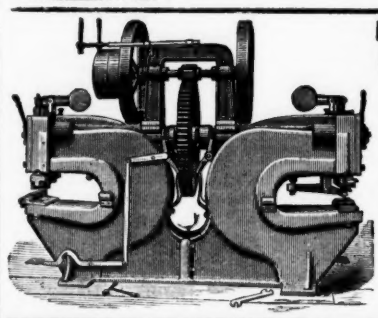

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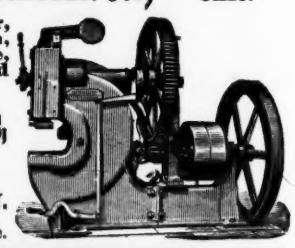

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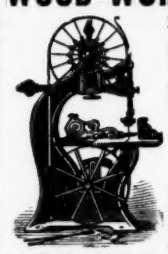

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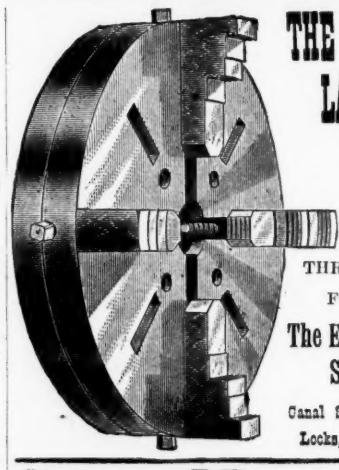

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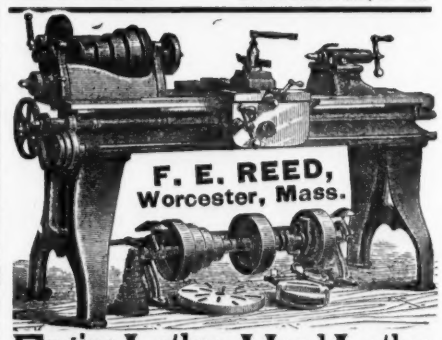

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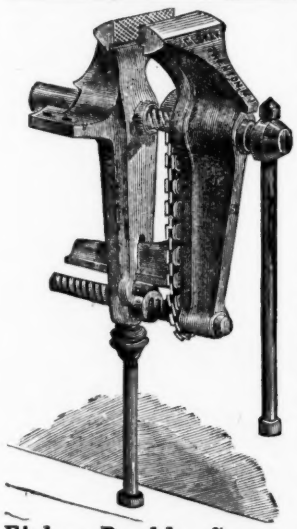

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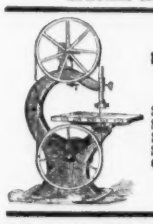

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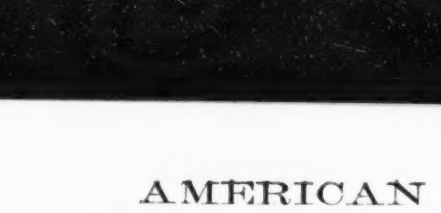

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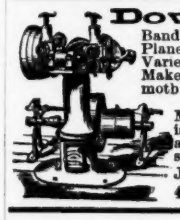

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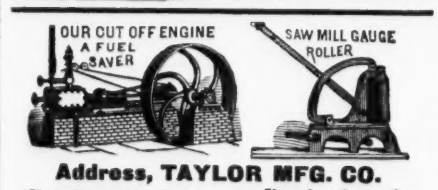

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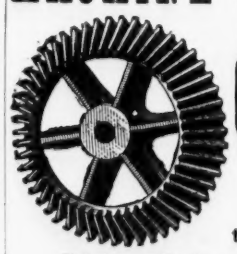

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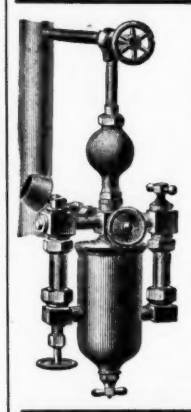

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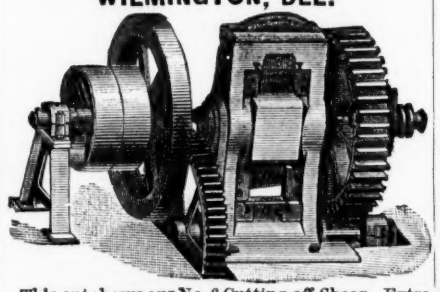

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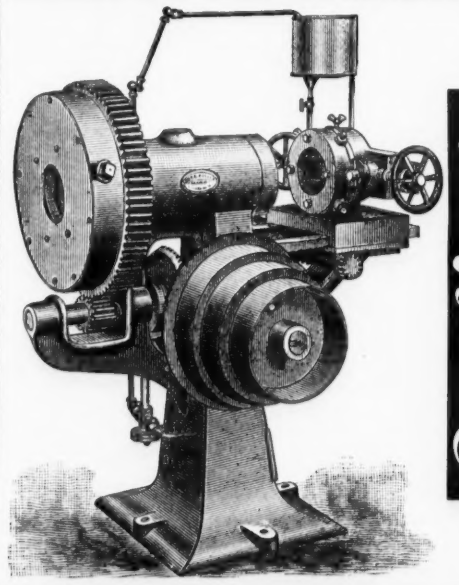

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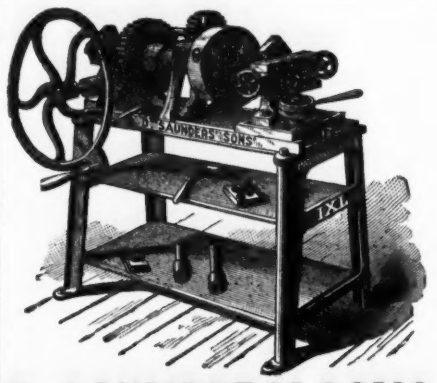

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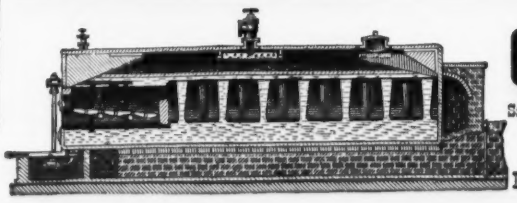

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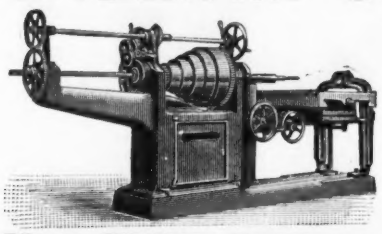

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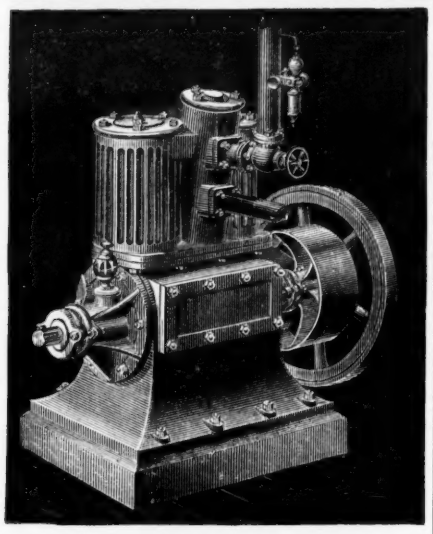

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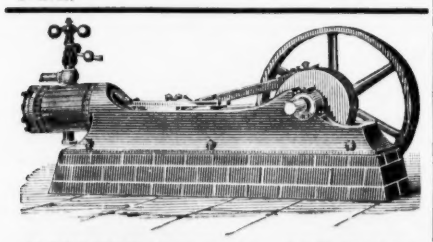

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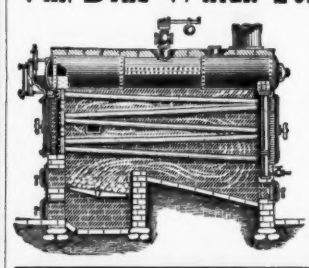

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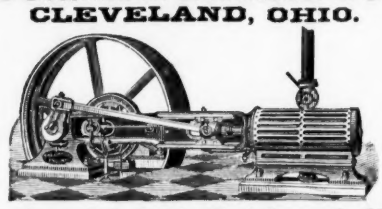

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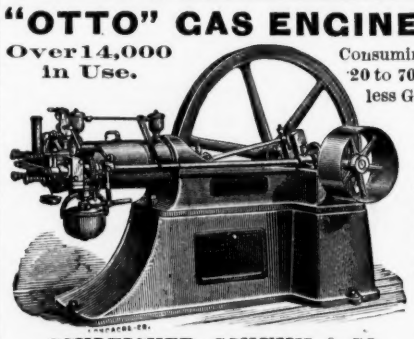

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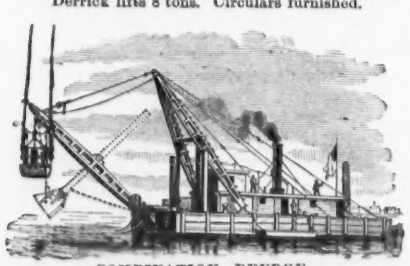

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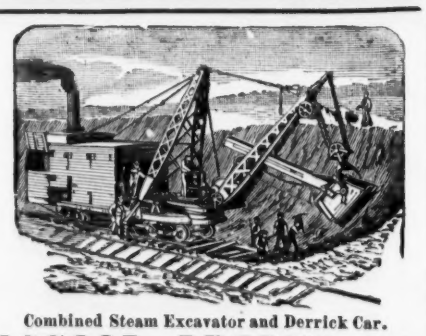

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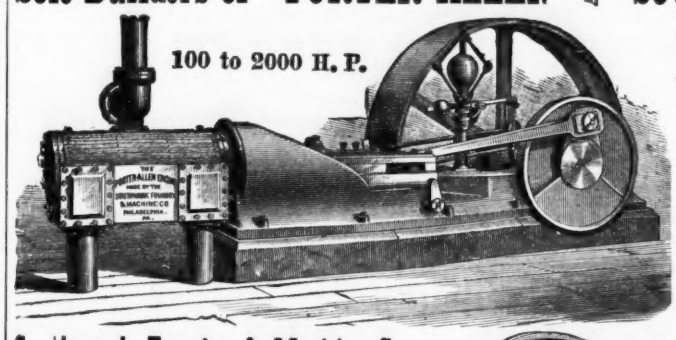

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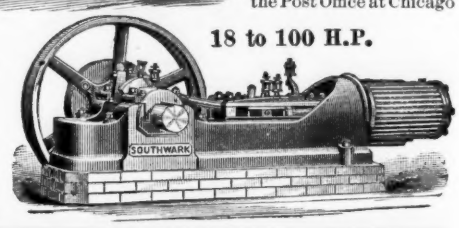

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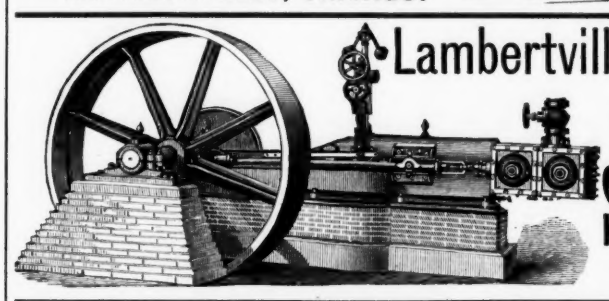

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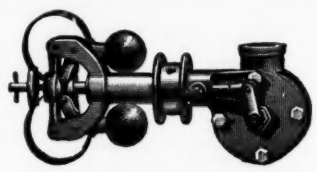

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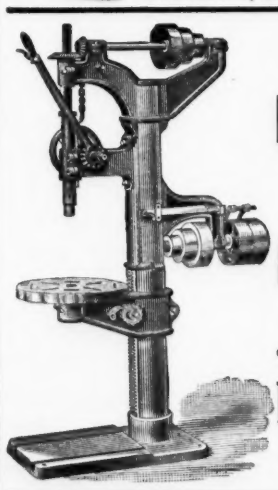

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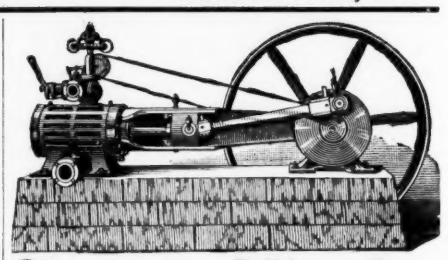

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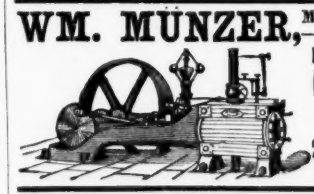

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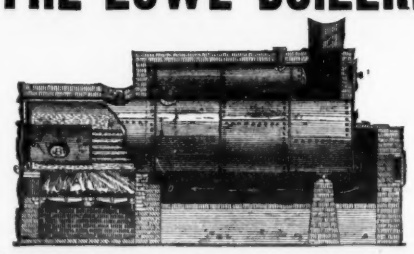

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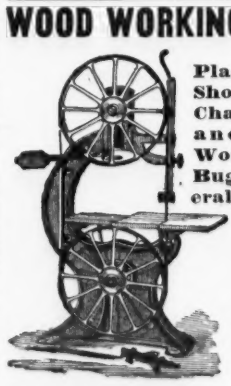

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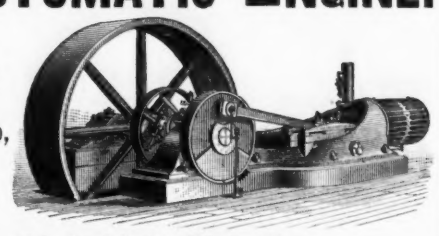

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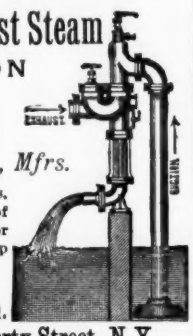

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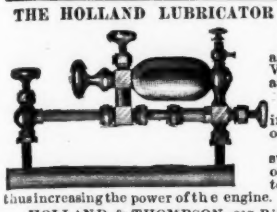

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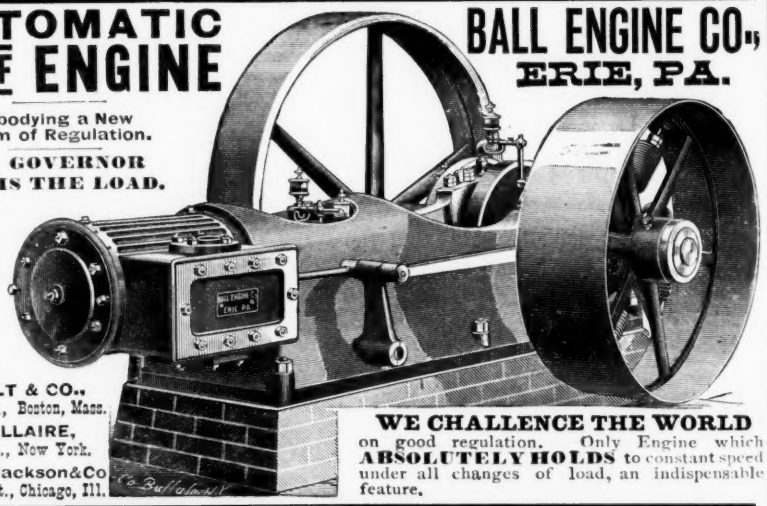

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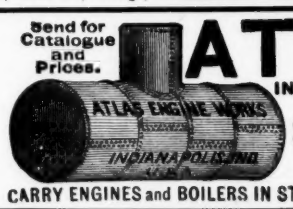

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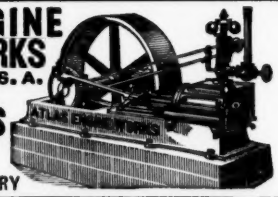

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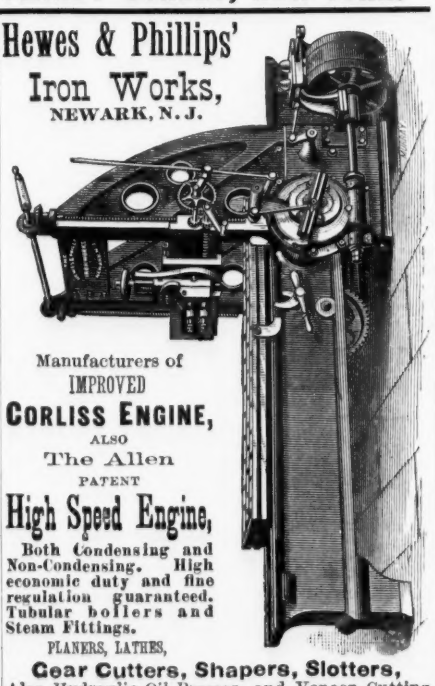

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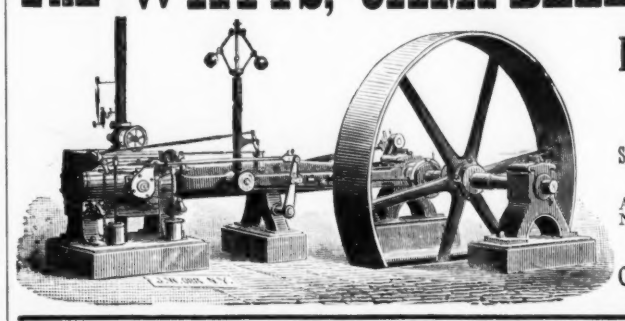

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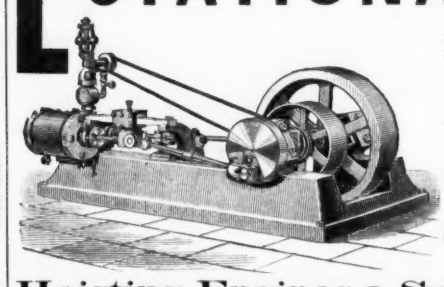

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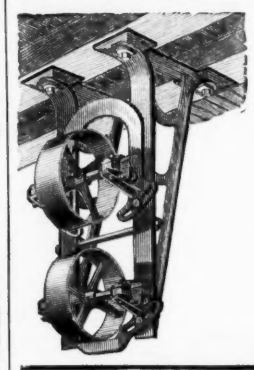

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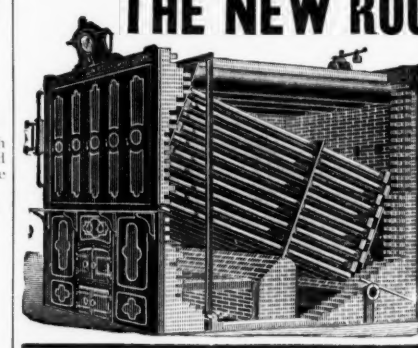

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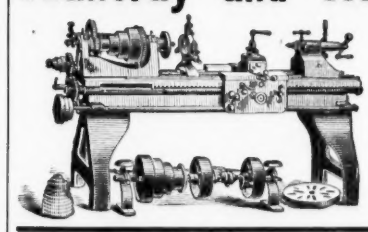

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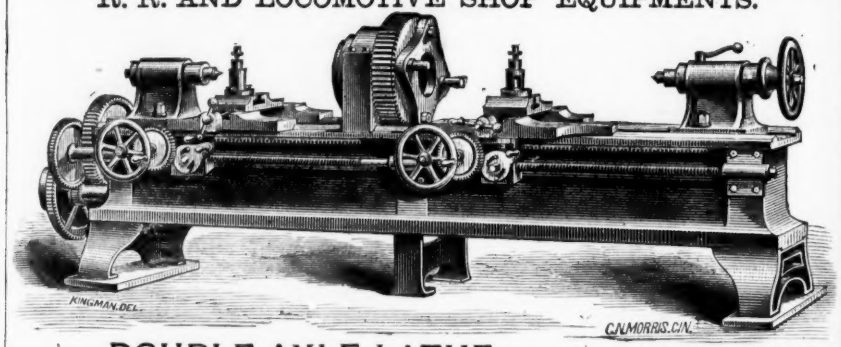

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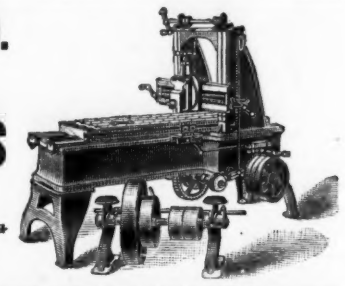

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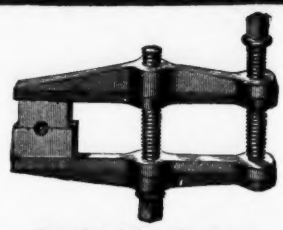

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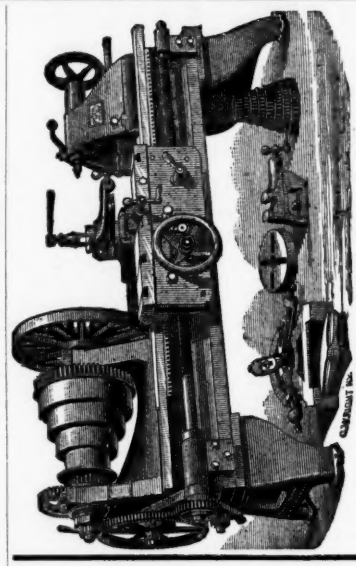

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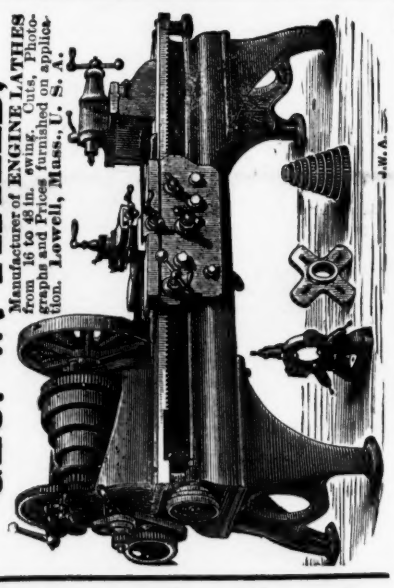

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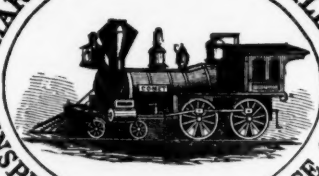

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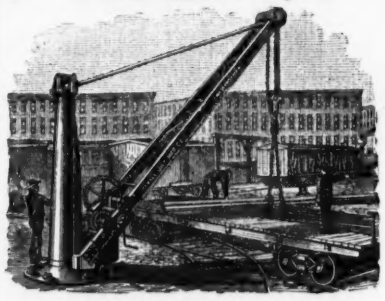

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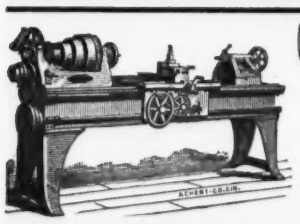

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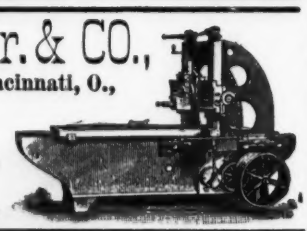

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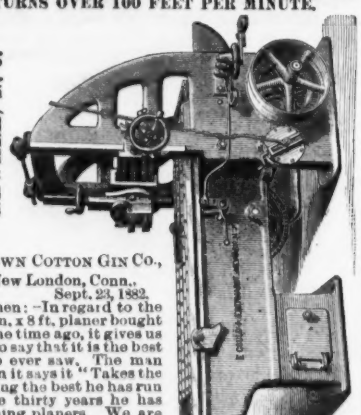

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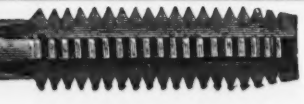

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